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INSTRUCTORS AND STUDENTS—QUEENSLAND AGRICULTURAL COLLEGE.

Students at Agricultural Colleges.

THAT Queensland lads should seek to enter Southern Agricultural Colleges, and that on the other hand the youth of the Southern colonies should apply for admission to the Queensland College, is not at all surprising. Indeed, we look upon this choice of agricultural educational establishments as an evidence of agricultural federation. The climates of New South Wales and of Queensland are not uniform. Here we have not only the conditions of the more temperate southern climate, but we have also a torrid zone, which is only equalled by that of South Australia, or rather we should say of the Northern Territory of that colony, a territory commencing at about 26 degrees South latitude, and terminating on the shores of the Arafura Sea and of the Gulf of Carpentaria in the latitude of about 12 degrees South. Manifestly the conditions dominating agricultural industries in a colony whose latitudinal extent is from 31 degrees South, to 37 degrees South, and those which obtain in a country whose borders reach to the low latitude of 11 degrees South, must be very different. In our Northern territory, if we only consider the cultivated areas as far north as Cairns, we find that the true tropical products of the soil are those which could not by any scientific or mechanical means be reproduced in any of the colonies south of Queensland. Take, for instance, rice, ginger, spices, coffee, tropical fruits and fibre plants, and even sugar. None of these, except perhaps sugar, can be produced south of Cape Byron, commercially speaking. They require the constant warmth and moisture of the Northern coast districts. Sugar can only be successfully grown in New South Wales in the Clarence, Richmond, and Tweed river country; whilst Queensland can produce everything which can be profitably grown in the South. It has been said that apples cannot be grown to perfection in Queensland. This is as fallacious a statement as the old mendacious story of the impossibility of growing cabbages on the Darling Downs. We have seen and tasted apples growing in the colony which were not surpassed by any we have seen in other colonies of Australasia, whilst as to apricots we have not yet seen any of this class of fruit either in Tasmania, Victoria, or New South Wales which could approach in size and flavour those of the Darling Downs and Stanthorpe. Again, where are finer strawberries produced than in the Blackall Ranges not fifty miles from Brisbane, or at Townsville in the North? Or take our wheat country. The areas already under wheat cultivation and those eminently adapted for that cereal are practically illimitable, extending from the latitude of Barcaldine, west of Rockhampton,* to the neighbourhood of Brisbane. It is the same with other products such as barley, oats, lucerne, &c., whilst potatoes are successfully grown as far North as Cairns. When we come to consider such crops as sweet potatoes, yams, manioc, arrowroot, we find that Queensland is the home of these products.

Now, taking these things into consideration, it will be asked why should a lad from New South Wales come here to learn the method of cultivating tropical crops which he can never hope to grow in the South? And on the other hand what can induce a Northern farmer's son to go South to learn what will probably be of little use to him when cultivating a tropical farm? As well might an Australian go to a Canadian Agricultural College to fit him for tropical agriculture, or the Canadian attend at the Kamerunga State Nursery at Cairns to learn how to provide for his farm stock during a North American winter.

There is, however, a reasonable side to the question. Our Queensland Agricultural College is yet in its infancy. It is certainly presided over by a thoroughly competent principal. It is also provided with a competent staff. It will, in a few weeks, have a complete chemical laboratory, and the students

* The harvest at Barcaldine this season has been very successful. Some fields are said to have yielded over 30 bushels per acre.

have already the advantage of instruction from one of the best agricultural chemists in the colonies. It lacks, however, dairy instruction. The dairy herd at present at the College is composed of first-class well-chosen breeds of dairy cattle; but instruction in this important branch of the agricultural industry is not yet available, although a few weeks will see this study added to the curriculum. Now we need not travel far in any of the eastern colonies to see that dairying is taking a firm hold of the agricultural population. All over Queensland, south of Rockhampton, farmers are going in more and more for dairying. At the Tweed River, sugar is rapidly being displaced by the same industry, and there is money in it. The work of our travelling dairies has borne, and is bearing, fruit more than ever. The instruction given by our dairy experts to the farmers in many parts of the colony has fallen upon attentive ears, and as a consequence this industry is progressing at a marvellous rate. Men say, "If sugar fails, butter and cheese, bacon and hams, will fill the gap."

Now, although our farmers have gained wisdom by the instruction named, their sons require more continued instruction, and this they expect to get by attending the Southern Colleges. Those Colleges, moreover, are not of late growth. They are firmly established, and are replete with every modern contrivance for imparting complete agricultural instruction. Like our own College, their instructors are many and are highly efficient, but some subjects they can only impart *theoretically*, whilst our College can impart them *practically* to a great extent.

In all that regards the cultivation of cereals, fodder plants, fruits, and vegetables of temperate climates, their teaching is unlikely to be surpassed. But apart from, or rather in conjunction with these, the Queensland College, Nurseries, and Experiment Farms can impart practical instruction in tropical agriculture which would be valueless in the South, but priceless here. As to the general principles of agricultural instruction, these can be given as well at the Wagga, Hawkesbury, or Gatton Colleges, the Westbrook, Hermitage, or Kamerunga or Mackay Experiment Farms and Nurseries, as in Manitoba or Jamaica. Theory combined with actual practice is what is wanted in these colonies, and we see only a commendable spirit of reciprocity in this desire of our boys to study in New South Wales, and of the Southern lads to take a course of instruction in Queensland.

The Queensland Agricultural College.

PROFESSOR E. M. SHELTON, Principal of the Agricultural College at Gatton, gives the following *résumé* of the work done at that institution during the first term:—

We are just now about to bring to a close the first term in the life of the school (remarked the Professor), and it has been a very satisfactory one to all concerned. The College has been in existence almost six months. It opened its doors on the 1st July, and the examinations and the breaking-up exercises are fixed for the 13th and 14th of December. We began work on the 1st July, with an enrolment of twenty-four pupils, and the enrolment now totals thirty-three. Moreover, the unanimous opinion of the students is that they are going on, most of them with the intention of finishing the work they have undertaken. After the Christmas holidays, work will begin anew on the 12th January, with the assurance of a considerable increase in our members. In this connection I may state, we have had a number of applications from New South Wales for admission to the College. With our students' help we have stumped, grubbed, and burnt an area covering 8 or 10 acres about the College grounds; and, besides this rough work, a vast amount has been done in other directions. We have broken up and planted 100 acres of land, and when I say broken up, I mean not only has it been turned, but that it has all been cross-ploughed, and much of it planted. We have two crops of 60 acres of maize, and 40 acres additional are nearly ready for planting. This maize is a magnificent sight, much of it being shoulder high, uniformly even, and full of promise. Again, we have grown 6 or 7 acres of potatoes, 7 acres of setaria, and a great variety of garden products; and I may add that our garden crops have made us famous all over the district. We have been sending College-grown cabbages and cauliflowers to Brisbane, and as far west as Clifton. To show what these vegetables weigh, I may say that we sold them under a guarantee that the cabbages would not run less than 8 lb. per head. Among the smaller undertakings may be mentioned the planting of 6 acres of orchard and vineyard. Then we have a great variety of experimental crops; among these, 340 varieties of wheat. We have 4 acres of castor beans—another experimental crop. Seeing that we import into this colony annually 56,000 gallons of castor oil, and as the castor bean is found to be a profitable crop in the State of Kansas, it would seem to be worth while to try whether the manufacture of castor oil may not become a Queensland industry. Then we have some 4 or 5 acres of cow peas, 2 acres of loja beans, and about 3 acres of haricots. These haricots are wholly imported. The growth of these beans has been one of the most interesting little undertakings of the year, although the season has been wholly bad for this particular crop, being much too wet and hot early, and too dry later on. The crop, however, is a beautiful one, and gives me every encouragement to believe that the growth of this staple bean will get a place among the industries of the colony. I suppose our College crops are a fair index to the condition of the general crops of the country. Our wheat was a magnificent experiment. Of the 340 varieties grown, about forty showed themselves actually rust-proof. These forty wheats, I need not say, are very valuable, having passed the ordeal in this way. The maize in the Lockyer district—that is, the early crop—is suffering seriously from drought, and much of it is now past hope. But herein the Queensland farmer has a great advantage. He can still plant maize with a reasonable assurance of a crop. Of the College crop of maize, I can only say that if the drought proves fatal we shall promptly make ensilage of it, and replant the ground for a late crop.* We have just begun work upon a College dairy, all of which, by the way, was done largely by our students, so that in another term we shall add regular dairy instruction to the College work. We shall also be able to give our students regular practice in the chemical laboratory, an advantage not hitherto enjoyed.

* Splendid rains have since fallen, and crops of maize are everywhere luxuriant.—Ed. Q. A. J.

Wagga Experiment Farm.

ABOUT 100 visitors (says the special correspondent of the *Sydney Stock and Station Journal*) journeyed to Wagga to see for themselves the results of Dr. Cobb's famous experiment with the improved Allora Spring Wheat. When the guests were assembled at the paddock, the doctor made a speech. He said that the paddock at the beginning of the year was ordinary forest land, and cleared at a cost of £2 per acre. Part of it was ploughed after the January rains, and was allowed to lie fallow and then sown, but at the beginning of July he decided to sow the area under observation with Improved Allora Spring Wheat, and had the land ploughed six inches deep, partly by contract and partly by men of the farm. The contract cost 6s. per acre. After ploughing, the land was gone over with a spading harrow, and then the ordinary harrow, after which the wheat was drilled in at little less than a bushel to the acre. This variety of seed had been improved by experiments at this farm during the past five years. The cost of putting the wheat in and making it ready for market was 30s. per acre, or, with the cost of clearing, £3 10s. per acre. This included manuring with medium grade superphosphate, which cost, delivered there, about 10s. per acre. Some adjoining crops sown early were decided failures, particularly one of King's Jubilee species. We saw a very good crop of Algerian oats, estimated to yield a ton to the acre, and several other smaller plots of wheat, which it is intended to test right up to the milling stage, and even to bread-making, in order to fully classify and tabulate the respective values of the different varieties from a commercial standpoint, which is very important, in the light of Mr. W. Farrer's opinion of Allora Spring Wheat, and the experience of Mr. White, of Belltrees, Scone, with his parcel of flour sent to a Sydney baker for report. This, however, is all by the way. We were at the paddock, and most of the visitors alighted, examined the wheat, and passed judgment. I thought it important enough to get the opinion of three or four representative men present, and here follows what they said. The first wheat-grower I asked for an opinion was Mr. B. B. Bennett, who cultivates between 2,000 and 3,000 acres:—

Mr. Bennett said: "The experiment is quite as good as could possibly be expected, and the experiment cannot fail to be beneficial to wheat-growers."

Mr. J. J. McNickle, a thirty-five-year Riverina wheat-grower, said: "My opinion is that had the season been fairly favourable the crop would have averaged 16 to 20 bushels to the acre. As it is, I think it will not go much beyond half that; it might reach 12 bushels, but I very much doubt it. But, to have had a full experiment on the advantages of the manure, several strips should have been put in at the same time without manure, to see how they would compare with that treated with the superphosphate."

Mr. James Gormly, M.P., said: "The experiment under the conditions that have been carried out has been a thorough success."

Mr. Alderman J. B. Edney, a practical wheat-grower in Wagga for thirty years, said: "For such a season the experiment has been an undoubted success."

Others spoke in a chatty way, and the consensus of opinion was that the plot would yield about 10 bushels to the acre, and an ordinary sowing without manures, such as Mr. McNickle remarked should have been done, wouldn't have yielded more than 4 bushels to the acre. The various plots should be photographed.

DR. COBB, in writing of this farm, says :—

“I am glad to state that, in spite of the recent unfavourable weather (November), the Wagga experiment crops in the main are looking very well. The seed wheat plots and paddocks in particular are looking very well, and promising a yield much higher than round about. The orchard is in tip-top condition, and a good crop from very young trees seems assured. The grapes are blooming well. The experiment work has never before yielded such valuable results. The new elevator and laboratory are near completion, and have been universally admired, and an official opening of same is talked of. The recent addition, by which this farm has been made nearly half as large again, is being surveyed and fenced. One thousand five hundred acres have just been ringbarked, to be used in connection with sheep-farming and horse-raising. Applications for intending students are coming in satisfactorily, the fresh acquisitions to commence work in January, when a new course under an enlarged staff of teachers will begin. The early spring wheat sown in August on land ploughed in latter part of July, and which had been cleared of timber only three months earlier, is considered to be a great lesson by all the farmers who have seen it.”

The wheat was the variety known as “Improved Allora Spring,” and was reaped in November. The yield was 20 bushels per acre. The land had been manured with superphosphates at a total cost of 10s. per acre.

Agriculture.

GREEN MANURING.

IN the seventh series of his *Etudes Agronomiques*, M. Grandeau, the Inspector-General of the French Agricultural Experiment Stations, publishes some interesting notes concerning the important functions of leguminous plants in the fixation of nitrogen. After alluding to the discoveries made by M. Pasteur, who demonstrated the incessant and colossal action of bacteria, which had hitherto been ascribed to chemical agency, M. Grandeau briefly describes the character of the investigations undertaken by Hellriegel and Wilfarth, whose labours were suggested and influenced by the work of Pasteur.

Hellriegel for some years cultivated various cereal and leguminous crops in sterilised soil, and added their necessary alimentation in the shape of nutritive solutions of phosphoric acid, potash, and nitrates. In the case of the cereals the resulting crop was distinctly in proportion to the quantity of ammonia placed at its disposition, and in no case did the cereals develop when supplied with nutritive solution in which nitrogen was absent. On the other hand, the leguminous plants differed extremely in their growth. In some pots the plants flourished, in others they barely existed, though the conditions were exactly similar. Upon examination, it was found that in the former case there were numerous nodules composed of micro-organisms upon the roots, while in the case of the weakly plants the nodules were absent. In 1886, Hellriegel, after a long series of experiments, announced to the scientific world the fact of the fixation of nitrogen by the bacteria of the nodules on the roots of leguminous plants, and he held that this was the source whence these plants drew their supply of nitrogen.

M. Grandeau goes on to give an account of the nodules of leguminous plants, and of the bacteria within them. It had been shown that plants of this kind could not exist in sterilised soil and absolutely cut off from nitrogen; and, from experiments made by Dr. Nobbe, it was ascertained that the bacteria in the nodules of different species of leguminous plants differ essentially in their physiological properties, in that they form nodules easily on the roots of plants of the same species as those from which they originated, while they have not nearly so much influence upon allied species, and hardly any influence on the roots of leguminous plants of a widely removed species.

Further knowledge is required as to the degree in which the bacteria of species of leguminous plants, more or less closely allied, are active in respect of the different species of the same family, and it is especially important to have more precise information on this point, as M. Grandeau remarks that henceforth inoculation by means of soil containing bacteria should be adopted in the culture of leguminous plants; but this factor, in the opinion of Dr. Nobbe, does not yield in importance to the proper selection of mineral manures.

From the fact that leguminous plants obtain from the air, an exhaustible and gratuitous source, the nitrogen necessary for their development, they occupy an increasingly important position among cultivated crops. Varying with the species cultivated, the nature of the soil and the climatic conditions of the season, a crop of leguminous plants fixes considerable but different quantities of nitrogen obtained from the atmosphere. These quantities vary from 53 to 134 lb. per acre. If a leguminous crop is dug in green, the amount of nitrogen resulting from it, according to M. Grandeau, is equivalent to a good dressing of nitrogenous manure—nitrate of soda, sulphate of ammonia, or farmyard manure. If the foliage of the plants is utilised for cattle, the stems and roots remaining in the ground contain enough nitrogen to ensure a full yield of cereals or other plants.

An interesting account is given by M. Grandeau of the results of the inoculation of soil with bacteria adapted to the different leguminous plants, which, he shows, may increase enormously the assimilating power of these plants. Inoculation is accomplished by broadcasting on the land to be planted varying quantities of finely comminuted earth taken from a field which has borne a crop of the same species of leguminous plant which it is intended to cultivate. Among numerous experiments in this direction, M. Grandeau cites some made by Professor Frühweh at Mædling, with yellow lupins, serradella, *Ornithopus sativus*, and *Lathyrus silvestris*, in calcareous soil. Of two plots of land planted with serradella, one was treated with a small quantity of earth impregnated with bacteria from previous cultures, and the other was not so treated. On the 9th of August it was found that the crop on the plot that had been inoculated was more than three times the weight of that on the plot not inoculated. In the former case the roots of the serradella were covered with nodules, in the latter case they were absolutely wanting.

The land on which the lupins were grown was inoculated with earth from soil that had previously borne lupins. On one plot the quantity of impregnated earth equalled about 8 cwt. per acre, and on another 16 cwt. per acre; the third plot was not inoculated. The plants on the first plot reached an average height of $15\frac{3}{4}$ inches, and the weight of the crop on this plot was double that on the plot not inoculated. The crop on the second plot was more than one-third larger than that on the first plot, and three times larger than on the plot not inoculated. Inoculation had apparently doubled and trebled the crops according to the quantity of bacteria-infected earth supplied. M. Grandeau states that the result of the experiments on two other beds equally demonstrated the advantage of inoculation.

In some other experiments the quantities of bacteria-infected earth applied ranged from half a ton up to one and a-half tons per acre, and the results were equally marked; but, as M. Grandeau admits, there are many questions as to the influence of the inherent fertilising qualities of different soils, as to the effect of this or that leguminous plant, and as to the quantities of earth to be employed for purposes of inoculation, which require continued investigation. Nevertheless, the value of the process seems to be sufficiently established, and it may be adopted by practical men, especially as it involves but slight expense, and its results promise to be most advantageous to agriculturists.

Experiments can be made in two ways—1st, By broadcasting some hundredweights of earth taken from land that has yielded a good leguminous crop upon the field which is to be sown with leguminous plants. 2nd, By watering the field with water which has been in contact with earth from land which has yielded a good leguminous crop.

There is yet a third method of inoculation—namely, by means of the preparation known as “Nitragin,” to which M. Grandeau does not allude in the *Etudes Agronomiques*. This, however, appears to be even more simple and economical than either of the methods described by him, and it only remains to ascertain its actual value from the results of various experiments which are being conducted by scientific agriculturists in this country, and by investigators and cultivators in Germany. “Nitragin” is the pure culture of the nodular organisms found on the roots of leguminous plants; the method of obtaining these was discovered by Dr. Nobbe, of Tharand, in Saxony. The culture is placed in a bottle containing a nutrient solution, as agar gelatine, upon which it grows, and the bottle is hermetically sealed and kept from the light. “Nitragin” can be obtained in this condensed bottled form, derived from the nodules of several species of clover, lupins, beans and peas, tares, lucerne, sainfoin, and other leguminous plants, and suitable for application in order to promote and stimulate the growth of crops of the same species as that from which it was evolved. If this new and direct mode of inoculation should prove satisfactory, it will be a distinct advantage over the methods described by M. Grandeau, as the application is simple and inexpensive, and the inoculation of each kind of leguminous plant with its own peculiar organism can be easily ensured.

In connection with the various methods that have been described for the purpose of supplying nitrogen to leguminous plants by means of their specific organisms, it must be borne in mind that these processes will not produce satisfactory results unless there is a proper supply of organic and mineral manures, as potash, lime, and phosphoric acid, in the soils on which the crops are cultivated.— *Journal Board of Agriculture, England.*

FARM DRAINAGE.

As dairy farming takes the place of the ruder forms of agriculture, the farmer begins to see the necessity of having no idle acres on his farm. He learns that the highest economy in cow handling is to keep only *good* cows, and then keep each cow up to her *highest* productive capacity. Just as he departs from these well-grounded principles will he be punished therefor by a loss of revenue. These principles do not depend on the price he receives for the product. They work just the same, and must be obeyed more thoroughly in times of low prices than when prices are good, for only through their observance then can any profit at all be made.

So in the same relation to final profit stand the several acres of the farm. In dairying we farm by the acre and the cow. Each individual acre and each cow must come as near the average standard of good work, and to some profit at least, as our own intelligence and energy can make them. Acres and cows are simply forces, the same as are the men, horses, and guns of an army. One general handles these forces skilfully, and wins victory, even under great discouragements; another goes to defeat, even with a thoroughly well-equipped army. The same quality of a wise understanding of forces and good generalship is needed, especially on a dairy farm.

Many thousands of dairy farms have too many idle, unprofitable acres. They cost as much annually in interest, fencing, and taxes as the good acres. Much of this idleness and unprofitableness comes from bad drainage. It is a part of good dairy farming to bring all these forces or acres into active work for the owner. Therefore the question of tile drainage becomes an important one to consider on very many dairy farms. From that most excellent monthly, the *Drainage Journal*, we take the following data on this subject:—

THE DEPTH AND DISTANCE APART OF UNDER-DRAINS.

The readiness and rapidity with which soils drain depend upon the fineness and compactness of the soil particles composing them. If the material to be drained were coarse sand, a single drain might have an effect for several hundred feet on each side of it, whereas if it were close clay of certain kinds the effect of the drain would reach, perhaps, only 15 ft. on each side.

Dig a hole in the ground when the soil is saturated, and observe how rapidly the water fills it. Note the effect which any newly dug open ditch or natural drain has upon the adjacent soil. If these fill very slowly, the drains must be placed somewhat near, perhaps not more than 30 or 40 ft. apart. On the other hand, drains may be placed 50, 80, 100, or even 200 ft. apart in some soils, and the effect be all that is desired.

The depth at which it is profitable to place the drains is also contingent upon the character of soil treated, though it may be stated, as a general rule, that lateral drains should be 3 ft. deep. There are, however, many soils which may be drained 4 ft. deep. Orchards and fruit gardens should be drained to this depth, while there are soils underlaid with hardpan, containing in themselves no fertility, in which care should be taken to locate the drains as near as possible on the line separating the soil proper and the clay. If the soil is open, so that water percolates freely through it, the depth may be increased and the distance apart increased proportionally.

SIZE OF TILES.

For lateral drains no smaller than 3-in. tiles should be used, and for open soils, where the lines may be placed 100 ft. or more apart, no smaller than 4-in. tiles should be used.

The following tables may be used to determine the number of acres which a tile of given diameter and per cent. of grade will drain when used as an outlet. They are based on Kutter's formula, and are applicable to main drains, well laid, where the water is supplied to them by submains and laterals. Table 1 gives the discharge in cubic feet per second for sizes of tile drains from 4 in. to 20 in. in diameter, computed on a grade of 1 per cent., or 1 foot per 100. Table 2 gives the square roots of grades from 0.04 ft. per 100 ft. to 1 ft. per 100 ft.

Table 1.—Discharge of tile from 4 in. to 20 in. in diameter on a grade of 1 ft. to 100 ft. :—

Diameter of tile in inches.	Discharge in cubic feet per second.	Diameter of tile in inches.	Discharge of cubic feet per second.
4	0.16	12	3.40
6	.49	15	6.29
8	1.11	18	10.37
9	1.53	20	13.85
10	2.05		

Table 2.—Grades per 100 ft., and their square root :—

Grade per 100 ft. in feet.	Grade in inches (approximated).	Square root of grade.	Grade per 100 ft. in feet.	Grade in inches (approximated).	Square root of grade.
0.04	$\frac{1}{2}$	0.200	0.40	$4\frac{3}{4}$	0.632
.05	$\frac{5}{8}$	.224	.45	$5\frac{3}{8}$	.671
.06	$\frac{3}{4}$	.245	.50	6	.707
.08	$\frac{7}{8}$	.283	.55	$6\frac{5}{8}$	.742
.09	1	.300	.60	$7\frac{1}{8}$	.775
.10	$1\frac{1}{8}$	.316	.65	$7\frac{3}{4}$	.806
.12	$1\frac{1}{2}$	.346	.70	$8\frac{3}{8}$	.837
.14	$1\frac{3}{4}$	.374	.75	9	.866
.16	2	.400	.80	$9\frac{5}{8}$	.894
.18	$2\frac{1}{4}$	.424	.85	$10\frac{1}{4}$	.922
.20	$2\frac{1}{2}$	.447	.90	$10\frac{3}{4}$	.949
.25	3	.500	.95	$11\frac{1}{4}$	.975
.30	$3\frac{5}{8}$	.548	1.00	12	1.000
.35	$4\frac{1}{4}$	.592			

To determine the number of acres that a tile main of given size and grade will drain, multiply the discharge of the tiles, according to size, as given in Table 1, by the square root of the grade which it is proposed to lay the main as found in Table 2. When it is proposed that the main shall carry 1 in. in depth of water per acre in 24 hours, multiply this result by 24; if $\frac{1}{2}$ in., multiply by 48; if $\frac{1}{4}$ in., multiply by 96.

Example :—How many acres will a 12-in. main drain when laid upon a grade of 2 in. per 100 ft., using the $\frac{1}{2}$ -in. standard? From Table 1, a 12-in. tile on 1 per cent. grade is found to discharge 3.40 cubic feet of water per second. From Table 2 the square root of 0.16 ft., or 2 in., is ascertained to be 0.40 ft.; $3.40 \times 0.40 \times 48 = 65.28$ acres. The same laid on a grade of 3 in. per 100 ft. equals 81.6. For most of our open soils the $\frac{1}{4}$ -in. standard is what is used in practice, and is attended with good results. This is where drainage

water is taken from the surface as distributed by means of lateral drains into the 12-in. main, and not permitted to run over the surface until it accumulates in a few places and thence finds its way into the main drain.

THE COST OR PROFIT OF TILE-DRAINING.

The question should be looked at in the following way:—If the farmer owns his land, he must pay the taxes, keep up the improvements, and procure the necessary help and implements for cultivating it. If there is land which he cultivates at a disadvantage because it is too wet to yield a full crop, and possibly yields none at all, proper drainage will cause this land to yield a full crop without the expenditure of any additional labour, seed, or capital, and the entire increase may properly be regarded as the profit of drainage. A few examples which have come under the writer's personal observation will help to emphasise these general statements.

A 20-acre field which usually yielded only 25 bushels of corn per acre was tile-drained at a cost of £40, or £2 per acre. The yield after drainage was not less than 60 bushels of corn per acre, and the yield of other crops in the rotation was in proportion. This gain of 35 bushels at 1s. 3d. per bushel, the selling price of corn at that time, paid for the entire cost of the drainage the first year.

A pond, previously waste land, was drained at a cost of 30s. per acre. It was broken and sown to millet, and the first crop paid the expense of under-drainage. A farm of 160 acres situated in an Illinois drainage district was taxed £1 per acre for the general outlet. It was bought for £6, subject to the tax for £1, costing the purchaser £7 an acre. Tile-drainage and improvements cost £3 an acre, making the land cost £10 per acre. This farm was rented, and yielded the owner a rental of £1 per acre for four successive years, or 10 per cent. on the entire investment. He was then offered £16 per acre for the farm and refused it.—*Australian Field*.

Dairying.

THE DAIRYING SEASON OF 1896-97.

BUTTER EXPORTED TO LONDON.

By JOHN MAHON,
Dairy Instructor.

THAT the dairying industry of this colony is making very rapid progress is indicated by the number of tons of butter that have been exported to London this year—namely, 155 tons, which means about £14,420 worth, at 10d. per lb. This price, I anticipate, is, if anything, under the price that may be expected in London. £10,850 of the above sum has gone into the pockets of the milk-producers.

From these figures it must not be taken that the output of butter has only increased to the extent of 155 tons. It must be remembered that the Northern demand has increased very considerably. Owing to the ravages of tick fever, the production in the North has decreased to almost *nil*, thereby causing a big demand for dairy produce from the Southern parts of the colony, which otherwise should have been shipped to London.

Some people imagine that we should not export, while during some months of the year we import; but this has been the case in the southern colonies, and will be to the end of time. We never know how our winter months are going to turn out, and there is always a demand for fresh-made butter; consequently we never know how much should be held over in storage to supply the winter demand.

It is encouraging to know that the farmers have now realised the fact that there is a large profit in producing milk, and utilising the skim milk for pig-rearing. Some farmers who, until very recently, were prejudiced against the industry, or who were of the opinion that we could not turn out an article suitable for the London market, are now in receipt of handsome cheques monthly, and are also finding remunerative employment for members of their families, who otherwise would be compelled to leave their homes and seek employment elsewhere.

The opinion that the success of the dairyman is dependent on a good herd of cattle is fast gaining ground among the farmers, and this is indicated by the numerous inquiries that are being made for purebred stock. The importance of milking select herds cannot be too strongly emphasised, but it is to be regretted that there are still to be found dairymen who blindly adhere to the obsolete methods of milking any animal that will carry a hide, and allow the calf to get the best and major part of the milk.

It is pleasing to note that in some instances the dairymen are conserving fodder for winter feeding. All these reforms from the old obsolete methods of dairying mean that the industry must assume very large proportions in the near future. We have such an immense area of splendid cheap lands available for settlement, and so excellently adapted for dairying purposes, that no person can forecast the extent to which this industry is going to develop. Southern farmers are coming here daily, many of whom are settling here, and others returning south to dispose of their homes, with the view of settling permanently in Queensland. I have had an opportunity of meeting many of these southern farmers, all of whom express their surprise at the cheapness of agricultural land in this colony.

Since the inception of the creamery and factory system, progress in dairying in all its branches has been rapid; creameries and factories, co-operative and proprietary, are to be found in every district where a sufficient supply of milk is procurable. In numerous instances the co-operative system is superseding the proprietary.

Previous to the introduction of the factory system, there was no inducement offered to the farmer to carry on dairying. There was no suitable storage in which to carry over the surplus summer production, and, consequently, prices were so low that the pure milk in many cases was fed to pigs. Now that we are in a position to supply the markets of the world, we have no need to fear a lower price than 7d. per lb. for butter, and for some time to come prices will even exceed 7d. per lb. during the plentiful months. These prices should be sufficient inducement for the farmers to combine dairying with agriculture.

Prices in the London market this year have been somewhat higher than usual, owing, no doubt, to the demand being greater and the exports from many places being short of previous years.

During the first week in November this year, Victorian butter was selling in the London market at 104s. per cwt., Danish 108s., and New South Wales 100s.

If the Queensland dairymen are desirous of obtaining the highest prices in the London market, they must first of all adopt a system of regulating their herds so as to have the cows coming into milk in the early spring. The month of August is a favourable time.

At present the annual value of the whole dairy produce of the United Kingdom sold off the farms amounts to £32,493,000, or one-sixth of the whole income of British agriculture. In addition to this, twenty millions a year are paid for foreign dairy products. I think I am very near the mark in stating that the British production of dairy produce is developed to almost the limit, and the demand is ever increasing; and it remains for Queensland to keep up a good reputation, which can only be maintained by adopting better methods than are now adhered to in many cases. Serious neglect is noticeable in numerous instances, which is sure to militate against success.

Milk is being delivered to creameries in bad condition, the men in charge (in some instances) use no judgment in taking delivery, and, to my own knowledge, receive milk which should be thrown into the pigs' trough. Milk is carted to the creameries without any protection whatever from the sun's rays, and we all know that any bright material (not porous) is a conductor of heat. Cream is also being carted to railway stations in the same manner, and in many cases left on the platform for hours without any protection from the weather. I have also known cream to be kept for two days before being delivered at the railway station, and by the time it reaches the factory it is three to four days old, and not in a fit condition to be converted into a marketable article. Newly calved cows' milk is also delivered to the creameries. There are numerous other matters that I could mention, and which are likely to affect the industry. If those engaged in the business expect to uphold a reputation for Queensland dairy produce in the world's markets under existing circumstances, they are very greatly mistaken; and as there is no supervision over the sources of milk supply, I am at a loss to know how we are to overcome the difficulty.

In classifying butter for export, I found some excellent samples which were nicely packed, and well prepared for the market; and this, to say the least, is very creditable to those who prepared it. In other cases a great deal of neglect has been displayed in salting, packing, branding, &c., and the general appearance was in no way attractive to buyers. I found it necessary to reject some samples not only for bad packing but also for bad quality.

I find the majority of shippers in favour of Government supervision over the export trade, for without the Government brand, the agents here and elsewhere will not advance against the butter, which means that the companies with small means could not pay the farmers for their milk until the returns

were received from London, and, under such circumstances, would be compelled to shut down. All agents consider the Government brand a guarantee for good quality.

In concluding, I maintain that until the factory managers insist upon receiving nothing but a good quality of cream, and exercise more care in ripening the cream, we shall always have mixed grades of butter in every shipment.

QUEENSLAND BUTTER.

THE dairying industry is steadily advancing in this colony. Every year sees an improvement in the dairy herd, and the time is close at hand when the cow which at its best yielded six quarts of milk a day will be amongst the things that have been. Most farmers are now clear on the point that it is better to pay £10 for a cow which will yield twelve quarts of rich milk than 30s. for an animal which will yield only four or six quarts. They are also becoming alive to the necessity of careful feeding and housing and of cleanliness in the dairy. What they are, however, not sufficiently alive to is the necessity for co-operation, to ensure a proper return to the milk-producers as well as to the factory proprietors. In all trades there are certain to be unscrupulous men. Such things as the blending of inferior butters and selling the blend as first-class factory butter have been heard of in some countries, thus depreciating what should be one of the most valuable articles of export. Queensland factories are gaining a good reputation for turning out a first-class article, and we are assured by Mr. Mahon, who examined and branded the butter despatched to London on the 1st December by the s.s. "Gulf of Taranto," that the whole of it was of most excellent quality and would command a high price in the English market. Denmark is our great rival in the trade. With only a few days' sea-voyage against forty days from Queensland, their butter must command a higher price, as butter which is kept for a protracted period loses some of its rich creamy flavour. We shall await with interest the result of the present shipment, which consists of the best samples yet forwarded from the colony.

EXPORT OF BUTTER.

The following are the details of the export of butter during the month of November, under the provisions of the Meat and Dairy Produce Encouragement Act, to ports outside of Australasia:—

1897.						Boxes.	Net Weight.
						lb.	lb.
Nov. 10—	Lowood Creamery Factory Company	...	...	...	192	...	10,752
Nov. 16—	Happy Valley Butter Factory	...	...	...	280	...	15,680
	Lowood Creamery Factory Company	...	...	...	211	...	11,816
Nov. 26—	Silverwood Butter Factory Company	...	...	...	10	...	1,000
Nov. 30—	South Brisbane Butter Factory	...	...	...	54	...	3,024
	Donald Bros.	...	...	...	61	...	3,416
	Queensland Model Dairy F.F. and I.C.S. Com-						
	pany, Limited	...	...	...	601	...	33,656
	North Ipswich Butter Factory	...	...	...	260	...	14,560
	Silverwood Butter Factory Company	...	...	...	850	...	47,600
	Central Downs Dairy Company	...	...	...	150	...	8,100
	Lowood Creamery Factory Company	...	...	...	297	...	16,632
	Happy Valley Butter Factory	...	...	...	298	...	16,688
						3,264	182,924
						Tons	cwt.
						lb.	
Or, say						81	13
						28	

AYRSHIRE CATTLE.

IN connection with the illustrations of Ayrshires in the last number of this *Journal*, we have been favoured by the Minister for Agriculture, the Hon. A. J. Thynne, M.L.C., with the following recommendation by a committee of the Ayrshire Agricultural Association appointed to revise the points of excellence in the Ayrshire herd of cattle:—

AYRSHIRE AGRICULTURAL ASSOCIATION.

POINTS OF EXCELLENCE IN AYRSHIRE CATTLE.

Report to the general annual meeting of 19th February, 1884, of the committee appointed at general annual meeting of 30th January, 1883, to revise the points indicating excellence in the Ayrshire breed of cattle, and to consider other matters connected therewith.

The committee have made full inquiry in their separate districts, and have themselves carefully considered the questions submitted to them. They recommend that the memorandum of 1853 be amended as hereinafter set forth. There is added a ratio scale of points, to indicate relative importance.

For the present they refrain from passing any opinion upon the Guenon system or escutcheon theory, but owners may well test its value in their own herds.

In the course of inquiry and consultation, it occurred to your committee that either the Herd Book Society or some other permanent body in connection with the association should be retained to investigate all matters concerning the breed. The "Ayrshire" grows in favour year by year, not only at home, but abroad; it adapts itself apparently to any extreme of climate, and to any quality of soil. Whether for milk, or butter, or cheese, it seems to serve the dairyman better than any of its rivals. Therefore, in its home, the west of Scotland, there ought to be a special body taking special note of all that bears upon its improvement. The committee, therefore, beg to suggest that this be considered.

THE FOLLOWING IS THE PROPOSED RATIO SCALE OF POINTS.

	Points.
1. Head short, forehead wide, nose fine between the muzzle and eyes, muzzle large, eyes full and lively, horns wide set on, inclining upwards	10
2. Neck moderately long, and straight from the head to the top of the shoulder, free from loose skin on the underside, fine at its junction with the head, and enlarging symmetrically towards the shoulders	5
3. Forequarters shoulders sloping, withers fine, chest sufficiently broad and deep to insure constitution, brisket and whole forequarters light, the cow gradually increasing in depth and width backwards	5
4. Back short and straight, spine well defined, especially at the shoulders, short ribs arched, the body deep at the flanks	10
5. Hindquarters long, broad, and straight; hook bones wide apart, and not overlaid with fat; thighs deep and broad, tail long, slender, and set on level with the back	8

PROPOSED RATIO SCALE OF POINTS—*continued*.

	Points.
6. Udder capacious and not fleshy, hinder part broad, and firmly attached to the body, the sole nearly level and extending well forward, milk veins about udder and abdomen well developed. The teats from 2 to 2½ inches in length, equal in thickness, the thickness being in proportion to the length, hanging perpendicularly; their distance apart, at the sides, should be equal to about one-third of the length of the vessel, and across to about one-half of the breadth	33
7. Legs short in proportion to size, the bones fine, the joints firm	3
8. Skin soft and elastic, and covered with soft, close, woolly hair	5
9. Colour red, of any shade, brown or white, or a mixture of these, each colour being distinctly defined. Brindle or black and white is not in favour	3
10. Average live weight, in full milk, about 10½ cwt.	8
11. General appearance, including style and movement	10
Perfection	100

P.S.—The whole of this and other useful information on cattle-breeding and diseases in cattle will be found in a book, compiled by William Housman, under the heading of “Cattle, Breeds and Management”; price, about 4s.

JOHN MAHON,
Queensland Dairy Instructor.

DISHORNING CATTLE.

MR. ROBERT ARMSTRONG, of Boldon, Mackay, sends us the following description of a new apparatus for dishorning cattle designed by his brother, who is agricultural manager for Mr. John Gubbins, of Bruree, Limerick, Ireland. The accompanying illustration will explain how the work is performed:—

The method formerly adopted for performing this operation—by means of a pinchers for holding the beast by the nose, and a shears which only removed two-thirds of the horn—has been discarded by all those who dishorn a large number of cattle yearly as being most unsatisfactory; even the saw has to give way to a more modern invention. And any unbiassed onlooker can have only one opinion as to the usefulness of the machine invented by Mr. Armstrong, land steward, Bruree House, supplying as it does a long-felt want.

With the aid of a crib—which he also invented—for putting the beast into, it is possible for a man to drive in a two or three year old bull, and in four minutes let him out a dishorned bullock. To those who follow the practice of first knocking the beast down, tying up his legs, castrating him, then remove his horns with either the saw or shears, the above assertion will possess a Yankee flavour. Nevertheless, I have seen it done repeatedly.

The crib is made of wood ; it is 6 ft. long by 3 ft. wide ; in the centre a wooden door is hinged on to the bottom, but is 2 ft. shorter than the crib ; this is called the "squeezer." At one end an ordinary, old-fashioned bail is constructed—the movable post running between two iron bars screwed on to the top—so as to catch the beast's head. When this is done, the squeezer is pressed against him. Attached to the squeezer is a flat piece of iron about 18 in. long and 2 in. wide, with notches cut like the teeth of a saw. As the squeezer is forced against the beast, these notches hold it in its place by means of a catch screwed on the side of the crib.

For castrating, a small wooden pole is let in behind, resting on the sides of the crib. This can be moved backward or forward, according to the length of the beast, by means of two iron pegs inserted in the holes bored in the side for that purpose. The time occupied for performing these necessary details is half-a-minute, where efficient workmen are employed.

For dishorning, there are two pair of holdfasts driven into the bail outside the crib, and two small iron bars passed through, one catching the beast under the jaw, the other over the nose ; another bar is passed through two holdfasts inside the bail, catching the beast over the neck. The machine is then put in on the horns, and in forty seconds the beast is as pure a poley as man's ingenuity can make a shorthorn.

From the above it will be seen that from beginning to end of the two operations no ropes or tying materials of any description are required. And Mr. Armstrong claims to be the first in the United Kingdom who has dispensed with these necessary adjuncts where the old-fashioned method is still carried on.



MODE OF DISHORNING CATTLE.

The Orchard.

FRUIT CULTURE IN QUEENSLAND.

By ALBERT H. BENSON.

MULCHING.

THE object of mulching fruit trees is to keep the soil cool and moist; to prevent the excessive radiation of heat from the soil, which so often tends to scald, blister, or otherwise injure the trunk or main branches of many fruit trees, and to prevent in some measure the growth of weeds, thus saving expense in the working of the orchard.

Mulching, when carefully applied and properly attended to, is of great value to all fruit trees, citrus in particular, in warm climates, especially in districts where there are long, hot, and dry spells. Mulching consists either in spreading a layer of decomposing organic matter on the surface of the land immediately surrounding the tree and extending as far as the spread of the branches, or it may consist of a layer of fine earth produced by keeping the soil in a high state of cultivation, free and open, which is in fact the best all-round mulch.

Various materials may be used as a mulch, such as rotting straw, corn-stalks, decaying weeds or vegetables, leaf mould, fine top-soil, bush scrapings of leaves, small twigs, decaying branches, &c., cane trash, or any other waste vegetable matter; or, if desired, the material used may be valuable as a manure as well as a mulch, such as fresh stable or farmyard manure—manure from the compost heap, or plants grown for their value as green manure, such as green corn, cow peas, or other pulses.

Before applying the mulch, the ground should be forked up or cultivated round the trees, a fine tilth being thereby obtained, and on the top of this the material to be used as a mulch should be spread to a depth of from 3 to 6 inches, according to the mulch used. The ground not covered by the mulch should be kept in a good state of tilth as described under the heading of "Cultivation."

When the trees occupy the whole of and completely shade the ground, mulching to prevent radiation is not so necessary; still even in this case it tends to keep the soil cool and moist and to prevent surface evaporation.

Mulching has, however, one great disadvantage in this colony, in that the mulch tends to form a harbour for many of our most troublesome insect pests, so that, unless especial care is taken to keep these pests in check, the mulch may turn out to be of doubtful value, the good it does being counterbalanced by the injury caused by the insects it is the means of harbouring.

This drawback can, however, be overcome to a great extent if the mulch is removed from around the trees twice a year, the ground thus uncovered being forked over lightly and left exposed for a few days, when the mulch can either be replaced, or, if same is full of injurious insects, a fresh mulch altogether may be applied. When the mulch becomes infested with insects, it is best to destroy it, but when not infested and nearly rotten it is a good plan to fork it in round the trees, especially if the soil is more or less deficient in organic matter, as the addition of vegetable matter to such soils always increases their power of absorbing nitrogen and of retaining moisture.

From these few remarks it will be seen that mulching properly carried out and carefully attended to is undoubtedly of great value in fruit culture; but at the same time it may, if not carefully looked after, prove of very doubtful value; hence unless a fruitgrower intends to carry out mulching systematically and thoroughly, he had better leave it alone, especially in our tropical and semi-tropical districts.

PRUNING.

In a colony like Queensland, where the conditions are so variable, it is impossible to lay down any hard-and-fast rules for pruning, as the growth made by and habit of the same variety of fruit tree often varies considerably when the tree is planted in different districts or on different soils. At the same time there is a great want of knowledge of the principles of pruning throughout the colony; so that my object is more to show the best method of starting our trees and of pruning them for the first two or three years, rather than to go in for any elaborate description of the many methods of pruning various fruit trees.

The lack of a thorough knowledge of the principles of pruning fruit trees is detrimental to our fruit industry, inasmuch as the neglect of pruning is often accountable for a large proportion of the inferior fruit produced as well as for the dirty and diseased condition of many of our orchards.

The object of pruning is to produce a strong symmetrical tree, bearing large fruit of fine quality protected from sunburn, evenly distributed over the tree, and so arranged as to be easily gathered. The main trunk and branches should also be protected from sunburn, and the tree should be so shaped as to be easily approached by the horse in cultivation. Pruning to produce fruit, which is so necessary in England, will seldom be required here, as our trees are naturally so prone to produce fruit that it should be more the object of the fruitgrower to reduce bearing wood, and thus decrease the burden of the tree.

This would take the place in part of thinning out the fruit—a very necessary operation where quality is desired, and one that it pays well to give thorough attention to, as it greatly improves the size and appearance of the remainder, ensuring a ready sale at good prices. Even when the market is glutted with ordinary fruit, there is always a market for anything really first-class.

Should, however, the tree run entirely to wood instead of developing fruit, then it will be necessary to prune for fruit, and this is done either by root pruning or summer pruning, as it is found that by those means the wood growth is checked and fruit spurs are developed. Root pruning should be done in winter, and it consists in cutting off all roots with a sharp spade at a distance of from 4 to 6 feet from the trunk, or, in case of old trees, of cutting the roots on one side one season, and those on the other the next, so that the shock to the tree may not be too great, as would be the probable result if all the roots were cut at once. Root pruning is usually of most value in the case of pears and strong-growing American varieties of plums; but as a rule, where the orchard is at all deeply ploughed, the plough does all the root pruning required by other varieties of fruit trees.

Summer pruning comprises pinching back laterals and converting them into fruit spurs, instead of allowing them to grow unchecked and produce unnecessary wood, which will have to be removed the next winter pruning, and also in the suppression of undesirable growths which would have to be removed afterwards, so that the energies of the tree are devoted to building up the necessary permanent branches rather than towards unnecessary growths which are of no value. Many varieties of apples, pears, plums, and apricots are greatly benefited by this pinching back of laterals, as it clothes the main limbs of the tree with a system of fruit spurs, which will bear abundant fruit in a position where the tree is best able to bear it. Summer pruning is of great value in the shaping of young trees, and in this colony, if properly carried out, it will be found to be of equal importance to winter pruning, as the young tree can be brought into correct shape much earlier than in the case where winter pruning only is done; and the formation of long straggling branches more or less bare of fruit spurs or laterals, and consequently unprotected from the sun, is prevented.

Pruning to restore vigour to the tree is only applicable to old trees in which the root is still sound and vigorous and able to carry another crop.

The form of pruning best adapted to Queensland conditions is a modification of what is known as the "vase" system on a low head.

This form of pruning properly carried out gives a tree strong branches, having a general upright tendency, enables it to carry fruit without assistance, and effectually shades the centre from sunburn or scald. This latter consideration is of great importance, and if neglected it leads to serious loss in a hot climate.

The height at which the tree is to be headed will be influenced by location, as it has been found by experience that the higher the prevailing summer temperature and the greater the aridity the lower the tree should be headed.

The advantages of low heading are accessibility of fruit, ease of pruning, symmetry, solidity, decrease of danger from winds, and greater facility to approach the tree with the horse in cultivation. Where the trees are properly trained with low heads and obliquely-rising branches, as shown in the accompanying illustrations, one can get much nearer to them than in the case of trees headed high, with horizontal or drooping branches. These are, however, not all the advantages of low heading. Another very important thing in a hot climate is the shading of the trunk, and prevention thereby of sunburn, as well as shading the ground around the roots. It is also found that branches starting from near the ground make a more vigorous growth than when the tree is headed higher.

The general effects of pruning may be summarised as follows:—

1. Close pruning, when the tree is dormant, induces tree-growth. Hence, if a tree is feeble or has not grown as could be wished, it should be closely trimmed in the winter season, always cutting just above healthy buds.
2. A severe shock to the tree, whilst the sap is flowing freely, causes the tree to throw out fruit buds and spurs for the next season, and pruning whilst the tree is in blossom will cause that crop to set.
3. When tree-growth is desired, prune whilst the tree is dormant; but, if fruit is desired, prune either root or top whilst the sap is flowing.
4. For plums, prunes, and apricots, leave all the small spurs growing along the branches, no matter whether the tree is young or old, for on them the bulk of the fruit is grown. Head in well from the outside, which tends to develop these spurs, and also strengthens the tree, and the fruit is grown where the tree is best able to bear it.
5. Apples, peaches, and pears are inclined to bear nearer the tips, and young trees should be well headed in during the winter season, both to give the tree symmetry and strength, and also to induce a more vigorous wood growth, and prevent a premature bearing of fruit.

The first and most important step in the formation of the tree is taken as soon as it is planted out, and this has been already described in the October number of *The Queensland Agricultural Journal*, vol. 1, Part 4, page 314, under the head of "Cutting-back at Planting," so that I will not repeat what I then wrote, but will refer my readers to the number of the *Journal* just referred to.

I will, however, reproduce the illustration (Fig. 1) of cutting-back at planting, so that the various stages in the formation of the tree may be clearly seen, as the future shape of the tree depends mainly on this, the first pruning.

When cutting-back or shortening-in, the distance from the bud at which the cut should be made is best shown by the accompanying illustration (see Fig. 2), which has been reproduced from *Barry*.

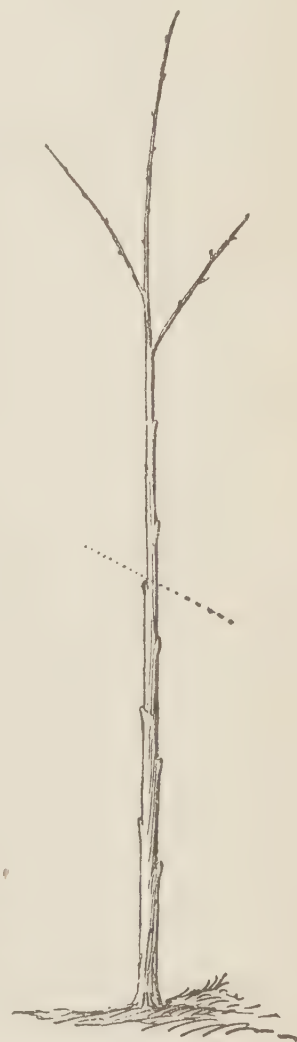
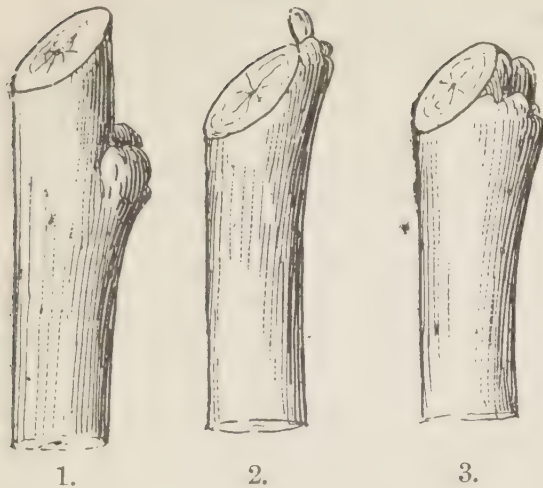


FIG. 1.—Cutting-back at Planting. First Pruning. The dotted line shows where the cut should be made.

FIG. 2.



- 1.—The cut is too far from the bud.
- 2.—The cut is too close to the bud.
- 3.—The cut is at the right distance from the bud.

Should, however, your tree, when purchased from the nursery, have laterals along its whole length, it will be necessary to remove them all after cutting away the top, care being taken not to cut them too close, and thus destroy the strong bud at their base, which will have to produce the future limb.

In forming the head, be sure to have the main limbs well balanced; and, as a general rule, I may say, three branches are preferable to four, and four to five.

In some cases, especially with apples and cherries, when the head is cut back to the desired height it will be found that only the top bud develops, the other buds on the stem remain dormant, and no proper head is formed. When this occurs the one branch that has started should be pinched back after it has made a growth of a few inches, and this check to its growth will cause those buds that are required to form a well-balanced head to start into growth instead of remaining dormant.

When the tree's growth during the first year is not excessive, it is not necessary to do any summer pruning, but it is better to leave the tree alone, as a good root system will thus be developed and a strong stem and main branches be formed; but in cases where the growth of deciduous trees is excessive, as is often the case in the more humid and tropical portions of the colony, summer pruning must be resorted to in order to prevent the tree from straggling all over the place, or from breaking apart by the mere weight of its top.

At the end of the first year, if the tree has received no summer pruning, it should be cut back to within 6 to 12 inches of the height at which the tree was originally headed (*see* Fig. 3), the exact amount of growth left depending on the vigour of the tree, as the stronger the growth the more wood is left, and the weaker the growth the more wood is cut away.

The object of this severe winter pruning is to produce a thoroughly strong foundation on which to build the future tree; for should the young wood be left on and go to fruit, though an earlier return would be obtained, the tree would break, and at three to four years would be straggling and ill-formed, requiring to be propped all round to carry its fruit, which will also be of inferior quality. And, in addition, it would be impossible to do anything with horse cultivation in such an orchard, as it would be difficult to get near the trees, thus requiring a large amount of costly and otherwise unnecessary hand

Having cut the tree to the desired height, allow the top three, four, or five buds to grow to their full extent, taking care that they come out at even distances along the stem, so as to get a properly balanced head; and it is better for them not all to start from the same height, but for each succeeding branch to be 2 to 3 inches lower than the preceding one, as this will tend to make a much stronger tree, and one less liable to split apart.

Having selected the necessary branches to form the future tree, the rest of the buds on the main stem should all be pinched back after they have made a growth of a couple of inches or so, so as to produce a tuft of leaves which will tend to protect the stem of the tree from sunburn till the top has made sufficient growth to do so.



FIG. 3.—Second Pruning.

labour. There is no economy in getting men to do labour at high rates which can be better and more thoroughly performed by a horse, and at a vast saving of time and money.

The following spring, each of the three, four, or five limbs that have been left will throw out branches all along their length, and, of these, only the two upper ones on each branch, on opposite sides of the branch, and having an upward tendency, should be left. All the others, after making a growth of 2 or 3 inches, should be pinched back so as to produce a tuft of leaves, as was done on the main stem the first year, to shade the branches, and throw out fruit spurs, which will produce fruit the following year. At the end of the second year you will thus have a stocky, well-shaped, evenly balanced tree, having six, eight, or ten well-developed branches, which will have to be shortened in to a length of 15 to 18 inches from the previous year's cut. (*See Fig. 4.*) The following spring, each of the six, eight, or ten branches are treated in the same manner as



FIG. 4.—Third Pruning.

the three, four, or five branches were the previous year—that is to say, only the two top buds of each branch are allowed to grow to their full extent, all the others being pinched back after they have made a growth of 2 or 3 inches as described in the remarks on summer pruning.



FIG. 5.—Fourth Pruning.

The results of these operations will be a strong, upright tree, of about 4 feet in height, ready to begin bearing, and one that will stand up under a fair crop of fruit evenly distributed over its branches. By this method of pruning, the orchardist will get his first fruit thirty months after setting out his orchard; but in many if not most instances it is advisable to delay a year longer, as when cropping is commenced too soon, before the trees are able to stand their fruit, there is a risk of breaking them down, and also of materially injuring their future health and productiveness. It is like hitching up a raw colt and expecting to get the work of an old horse out

of him, the result being he is broken down and useless just at the time when, had he been properly treated, he would have been of most value.

The following winter the tree receives its third winter pruning, and its appearance after being pruned is shown by the accompanying illustration. (See Fig. 5.)

The extent to which the tree has to be cut back at this pruning will depend on the strength of the tree and the kind of fruit. Generally speaking, the less the growth the more in proportion the cut back.

Under favourable circumstances, we shall now have a tree from 6 to 7 feet high when pruned, more if the growth has been extra, the branches of which have a general upright tendency, which will enable them to carry much more fruit than if left to straggle all over the place, and, moreover, cultivation may be carried right up to the trees. From this stage onwards the trees will only require a yearly shortening in, with the cutting out of any limbs that interfere with others, also, of course, all dead or dying branches. When it is found that the tree is of a spreading habit naturally, always, in pruning, cut to an inner bud, which will tend to confine it; and, if the tree is inclined to grow too upright, as is the case with some plums, pears, and apples, always cut to an outer bud; and, if it is desirable to continue the limb in a given direction, cut to an inner bud one year and an outer bud the next.

These general rules apply, with certain modifications, to all deciduous fruit trees—the especial class of pruning adapted to different fruits being treated further on. With regard to the pruning of existing orchards, the following advice may be of value:—In the first place, all branches, crossing or in any way interfering with any other branch, should be removed; and if the cut is a large one, it should be made with the saw, and the edges of the cut carefully trimmed with a knife, and the whole covered with grafting-wax, or a dressing of shellac dissolved in alcohol to the consistency of paint, and applied with a brush. This entirely prevents the wound souring, and, when the edges of the cut have been well trimmed, a new growth of bark will soon cover the cut. All dead, broken, or dying branches should be removed, and also all branches growing from the under side of the limbs which tend to trail on the ground, or, at any rate, open up the top of the tree, letting the sun directly on the branches, thus scalding them, and causing much dead wood. The trees should also be gone over carefully, and thinned out or shortened in where necessary; but, at the best, if the tree has been improperly started, it is a hard job trying to pull it into anything like a decent shape.

Above all, do not leave too much wood in the tree, but thin the head out well and evenly, so as to allow the air free access, and also so that spraying may be easily and thoroughly done, as this is impossible where the branches forming the head of the tree are crowded, and such trees cannot be kept free from insect and fungus pests. The head of the tree must not, however, be thinned out too much, as it is necessary that it be sufficiently shaded to prevent the sun from striking directly on the branches in the centre of the tree, which would thus be scalded and seriously injured, if not killed.

The tools required for pruning are a good pruning-knife, as shown in the accompanying illustration (see Fig. 6), a pair of 8 or 9 inch secateurs, and a good pruning-saw.



FIG. 6.—Pruning Knife.

When selecting a pruning-knife, choose one to fit your hand and preferably with a curved blade and handle, as with such you have more power and can make a clean drawing cut if the knife is in good order. When using a pruning-knife see that it is kept sharp, and always sever the branch with a drawing cut, as this ensures a clean cut and does not bruise the wood or bark, so that the wound will soon heal over. The best pruning-knives that I have used are those made by Saynor, and they can be obtained from most seedsman and hardware merchants.

In pruning-shears or secateurs it always pays to get the best, as inferior makes soon get out of order and do inferior work—bruising off rather than cutting the twigs or branches they sever. The lower or thick blade should be faced with hardened steel, as if of soft metal it will soon gap, and consequently do bad work. The cutting blade of the secateurs should be thin and of the best steel, and should be kept very sharp, as this will enable the work to be done much easier and more rapidly. For a pruning-saw the best I know of is that introduced into the colonies by myself, and sold by Messrs. Lassetter and Co., of Sydney and Brisbane, as the “California Pruning Saw.” (See Fig. 7.)

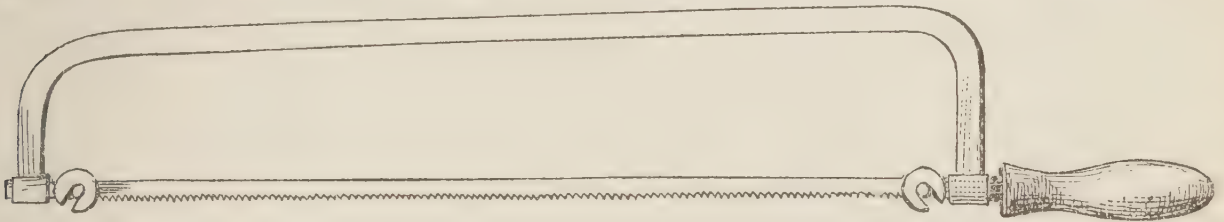


FIG. 7.—“California Pruning Saw.”

This saw is easy to work, does good clean work rapidly, does not buckle, and should a blade be broken another can be put in its place in a few minutes.

All heavy pruning of deciduous trees should be done during the winter, when the sap is down; and this applies also to evergreens, as the trees are then in a partially dormant condition. Lemons, oranges, or other citrus trees that require thinning out should be pruned as soon as the crop has been gathered in winter and before spring growth takes place. Watersprouts, by which is meant the strong shoots starting from the main branches and growing right up through the tree, should be removed from all trees, both deciduous and evergreen, whenever they make their appearance, and excessive straggling growths of all kinds should be shortened in. No suckers should be allowed; there should be only one main stem, and this should be kept free of all growths other than the head of the tree. In these general remarks I have endeavoured to show how best to shape the trees so as to get a strong, well-grown tree able to carry its fruit without support, and of such a shape that the ground can be cultivated right up to the trunk, with the improved implements of cultivation referred to under the heading of “Cultivation” in a previous number of this *Journal*.

Entomology.

BEES AND ORANGE BLOSSOMS.

THERE seems to be an impression amongst some orchardists that bees are injurious to fruit trees, and especially to the orange-tree, as it is believed that in seeking for honey they eat away the heart of the blossom.

A letter to this effect which we have received from an orchardist induces us to give our own experience, and also that which is most conclusive—the opinion of Mr. Henry Tryon, Entomologist, as embodied in the very able paper he forwards on the subject.

This has certainly not been our experience. On a sugar plantation at Pimpama we kept a quantity of bees, and several hives were placed on a circular lawn surrounded by orange-trees—principally mandarins. During the blossoming season the bees worked hard on the trees, but no bad result followed. The orange crop was very good. We have also noticed a large mandarin orange-tree at Nundah, which was frequented by countless bees, and yet the tree bore very heavily. It may be observed that the bee seeks very delicate blossoms, such as those of the silver wattle, but without any injurious effect on the after-crop of seed. The scarlet clover is fecundated by the labours of the humble bee, and if the insect ate its way into the flower surely such a large one as the humble bee would be able to effect serious damage. From personal experience we should be inclined to assert that the bee is not to be charged with the crime of ruining an orange orchard. If that were so, then the orchardists of orange-growing countries would long since have notified the fact to the world, and the bee would have been classed with the fruit-fly as a noxious insect. It is possible that entomologists may be able to show that the bee has the power of cutting away obstructions to its progress towards the honey-cells of flowers; but they have not as yet told us that they exercise the power injuriously. At all events, our experience, which extends over many years, embracing two orchards of several thousand orange-trees, has not given us any cause to banish the bee from the neighbourhood of the trees.

Mr. H. Tryon, to whom the question has been submitted, has supplied the following remarks, which may not be altogether devoid of interest.—Ed. *Q.A.J.*

BEES AND ORANGE BLOSSOMS.

By HENRY TRYON,
Entomologist.

In dealing with this subject, suggested by J. Emmerson's letter, one may inquire at the outset whether it be a fact or not that the ordinary honey bee, that frequents—as is a matter of common observation—the flowers of the orange, injures these or the tree that bears them in any way, either intentionally or as a consequence of this visitation.

Now, the writer has never received any testimony—except that above referred to—that this is so, either from orchardist or agriculturist; moreover, the extensive literature relating to the orange and its culture on the one hand and to the honey bee on the other, as far as can be at present ascertained, is alike silent on the subject.

In considering, in the absence of any direct testimony as to the fact of such occurrence, to what extent it is possible for the bee to occasion damage to the orange, one may profitably dwell upon the nature of the harm that this insect occasionally inflicts upon the flowers or fruit of other plants.

This injury may be of the kind mentioned by Charles Darwin as being inflicted by the bee upon the flowers of *Mimulus*, *Stachys*, *Antirrhinum*, *Lathyrus*, as well as on those of other garden plants. He informs us, for instance, that he had seen large beds of these flowers "in which the petals were scratched by the hooked tarsi" of this insect, and to such an extent that their "beauty was sadly defaced."*

It may be of a similar nature to that experienced by the blossoms of the rose, the flowers of which are oftentimes induced to pass off prematurely as the result of the action of the bee in insinuating itself amongst their petals in quest of the pollen and nectar that are to be met with in this situation.

Again, it may be of the kind that the above savant and others have noticed as suffered by many other bee-frequented flowers; these having holes gnawed through the corolla—or apposed corolla and calyx—that readier access may be gained to the nectar that they contain; although it has been shown that honey bees preferably avail themselves of the openings already made by other bees, rather than execute perforations—such as are alluded to—themselves. But even in those instances in which the latter is what really happens, and the bees do not originate the damage mentioned, still much harm may follow their action, for the principal damage that in this case results from the particular method of attacking the blossoms mentioned does not consist in the infliction of a mere mechanical injury, but is of an indirect nature. Exclusive resort on the part of insects to such perforations, and neglect to avail themselves of the ordinary means of access to the nectar, causes, as is now known, flowers that require cross-fertilisation to fail to exhibit the favourable results that would, under ordinary circumstances, in which no artificial means of access occurred, follow this food-securing act.†

Further, bees may accomplish a cross-fertilisation of flowers, in which those affording the pollen are not the most suitable of those available for acting in this capacity, as shown by the character of the fruit in which evidence of this cross is manifested.‡

As yet another instance of injury occasioned by the honey bee may be mentioned their habit of gnawing the surface of fruit and subsequently imbibing its juices through the perforations thus occasioned. The late Entomologist of the United States Department of Agriculture (C. V. Riley) has stated that his opinion concerning the question of Bees *v.* Fruit has been "that under certain conditions bees will and do injure certain varieties of fruit." H. G. Tryon, of Willoughby, Ohio, a practical fruit-grower of many years' standing, and one who kept several colonies of bees in connection with his orchard, has recorded regarding bees that he has observed that "they attack certain varieties of peaches with great avidity, working through the skin and eating into the flesh even before the fruit is thoroughly ripe, while other varieties, to our taste sweeter and riper, are left untouched. Hale's Early is always a favourite with them without reference to the supply of other food. Grapes they do not attack except under certain conditions."§

Now, the alleged damage to the orange that is attributed to the bee—viz., that which consists in "eating the very heart out of the blossoms"—does not partake of the nature of any of the forms of injury above described. It may,

* C. Darwin: "The Effects of Cross and Self Fertilisation in the Vegetable Kingdom," p. 425, London, 1876.

† On this subject the reader may consult C. Darwin, *op. cit.*, pp. 425-435.

‡ The reader, on mentally recurring to facts within his experience, may recall many instances of this description of injury. But, as bearing on the subject treated of, it may be mentioned that an influence of the pollen of the Scarlet Emperor Mandarin may be not infrequently remarked on the developed fruit of the ordinary round orange that displays itself in characters—additional to the one that consists in the assumption of a particular surface colouration—that are not always favoured. This is doubtless due to successive visitations on the part of insects—and bees possibly amongst their number—to the flowers of these two citraceous plants.

§ H. G. Tryon, "Bees *versus* Fruit," *Insect Life*, vol. i., p. 285 (1889): It must be admitted, however, with regard to the latter fruit, that the experiments conducted by N. W. McLain (*cf.* Annual Report, U.S. Dep. Agri. 1885, p. 336-9), having reference to the behaviour of bees towards grapes, place, as has been stated, the burden of proof, as far as this alleged pernicious habit is concerned, on the affirmative side.

therefore, be not without profit to inquire—What is the purpose, from the point of view of this plant, served by bees in visiting its blossoms? This, it may be affirmed, is the pollination of the flowers and the consequent fecundation of the ovules that their ovaries contain; and, not only this: under favouring circumstances cross-pollination and fertilisation as distinct from self-fertilisation. This, again, suggests other questions. Is this pollination of service to the plant as a fruit-producer or otherwise? If so, is cross-pollination a desirable end in itself?

In entering upon this inquiry, one is confronted at the outset with the absence of any record of exact information, in the case of the orange, concerning the nature of the means by which pollination as distinct from fecundation (the two constituting the fertilising act) is effected, as well regarding the relative values to the tree—as a fruit-producer—of the different methods by which this act might be consummated; of such information, in fact, as we have in the case of the pear, thanks to the exact and fruitful observations of Merton B. Waite.* On the other hand, very full information is available regarding the changes constituting the latter process in the individual flower that immediately result from contact of potent pollen with the stigma, and that succeed this fecundation of the ovules; W. Hofmeister, H. Schacht, and Dr. O. Penzig having each written very fully on the subject.†

It may be objected that as absence of seeds in the fruit, or their comparative absence, is an object that the orange cultivator should aim at, therefore the pollination of the flowers that results in seed formation is *redundant*, if not a harmful, act. But there exists little ground for concluding that any plant, much less the orange, can dispense with the act of pollination as a prior condition influencing the full development of its fruit. As M. B. Waite has remarked, in the case of some plants, the English cucumber, for instance,‡ it is thought to be true that the fruit without seeds develops when no pollen is applied. “Several times (he writes) in my own work (on pear blossoms, H. T.) flowers were emasculated and not pollinated, and with two exceptions failed even to set fruit. The two exceptions (he proceeds) occurred with the Le Conte and Heathcote. A few fruits set and were counted on the Le Conte, but none reached maturity. Three fruits set on the Heathcote tree at Geneva, and one of these developed. It was just like the self-pollinated fruits. This, of course (he adds), may have been accidentally self-pollinated before the flower opened.”§ This necessity for the act of pollination to precede fruit formation, the existence of which may be reasonably inferred, is intelligible when one considers, as pointed out by Focke, and as remarked also by Waite, that there are two actions of the pollen to be considered, and not one only—the one consisting in the fecundation of the ovules (seeds); the other in a stimulating action on the ovaries (fruit) that results in their development.||

The act of pollination then being essential to the formation of fully developed fruits, it may now be considered, whether in the case of the orange self-fertilisation—in other words, the setting of the fruit without the intervention of external agencies or rather of pollen derived by their instrumentality from a different horticultural variety or from an individual plant of the same horticultural variety, but grown under different conditions; or cross-

* M. B. Waite: “The Pollination of Pear Flowers,” Washington, 1894.

† Cf. W. Hofmeister: “Neuere Beobachtungen über Embryobildung der Phanerogamen,” in Pringsheim's Jahrbüchern für Wissenschaftl. Botanik, vol. i., Aurantiaceæ, pp. 94-5, Berlin, 1858; H. Schacht: “Ueber Pflanzen-Befruchtung,” 1858, pp. 209-216; and O. Penzig: “Studi Botanici sugli Agrumi e sulle Piante Affini,” pp. 83-98, Rome, 1887.

‡ Munson: “Secondary Effects of Pollination,” p. 44.

§ M. B. Waite, *op. cit.*, p. 73: It may be pointed out that this author includes under the term “self-pollination” transference to the flower pollinated of pollen from a flower of a tree of identical horticultural variety growing under similar conditions to that to which it belongs. When different horticultural varieties, or identical ones growing under different conditions, are concerned he employs the term “cross-pollination.” The present writer herein adopts the same connotation for the terms mentioned.

|| Cf. Focke: “Die Pflanzen Mischlinge,” p. 447.

fertilisation, be the form of procedure that is habitual with its blossoms; and if the latter, and this be accomplished by bees, whether it be of the two the process that is followed by the better of the results attainable.

That oranges may be self-fertile has been affirmed by G. Gallesio,* as we learn from C. Darwin (*op. cit.*, p. 394). Moreover, Dr. O. Penzig reports that the method of fertilisation by self-impollination sometimes occurs as shown by the researches of Prof. Delpino; this investigator having enclosed flowers and so secured them against the visitations of insects, with the result, notwithstanding, that some fruit set;† but he also argues, that in the case of the flowers of the orange their large size, their structure, their conspicuous colouration, their odour, and their abundance of nectar point to the fact that cross-fertilisation that is effected by insects is the form of fertilisation that almost always transpires. Without doubt, he writes (to render his statement in the English vernacular), the method of impollination that takes place in the orange is cross-fertilisation. He also informs us that in Italy—and the same is true with regard to that which occurs in Queensland—the common bee especially, but also a large number of other Hymenoptera of medium stature, seek with avidity the nectar distilled from the disc of the flower, and transport the pollen from flower to flower (O. Penzig, *l.c.*)

Thus, whereas natural crossing and crossing effected through the agency of insects—and especially bees—may both take place in the case of the orange, there are grounds for concluding that the latter is that which usually occurs. It is, moreover, probable that the benefits derived therefrom are in excess of those resulting from spontaneous crossing. In the case of this spontaneous process, it may be assumed that it more frequently happens than otherwise that the pollen or fecundating agent is derived from flowers close at hand—as, for instance, from adjacent branches of the same tree—than it does that this comes from the flowers of trees of a different horticultural variety than is represented by the one supporting the flowers under observation, or of such as is growing under different conditions than those that are found to obtain in its case. Now it has been experimentally shown by the late Charles Darwin “that the mere act of crossing by itself does no good, but that the advantages thus derived depend on the plants which are crossed, either consisting of distinct varieties which will almost certainly differ somewhat in constitution, or on the progenitor of the plants which are crossed, though identical in every external character, having been subjected to somewhat different conditions, and having thus acquired some slight difference in their constitution.”‡ This necessary condition for successful crossing has been found to be especially true in the case of the pear. M. B. Waite has shown that self-pollinated fruits, using the term as before explained (*vid.* Note p. 30), may be readily distinguished from cross-pollinated ones, even when growing side by side on the tree, by difference of size, amongst other distinguishing characters that are in favour of those fruits that have originated from the latter process. On the subject of this enhanced size, he writes: “In the self-pollinated there was a tendency to be smaller. Their average size was less, although many individuals compared favourably with the crosses. The largest fruits, however, were always crosses. . . . A self-pollinated fruit, favourably situated, may grow to be larger than a cross on the same tree less favoured, while on the other hand a cross under the same conditions would exceed the the self-pollinated pear. Cross-pollination may be regarded, with vegetative vigour of the tree, as one of the factors in the production of fine fruits.”§ The same able investigator also remarks (p. 73) that “the tendency of the self-pollinated fruits is to be narrower, and not well filled out at the blossom end.” Self and cross pollinated fruits, when hanging side by side upon the

* Probably in his “*Traité du Citrus*,” Paris, 1811.

† O. Penzig: “*Stud. Botanici sugli Agrumi*,” &c., p. 65, Rome, 1887.

‡ C. Darwin, *op. cit.*, p. 297. Cf. also *ib.*, chap. vii.

§ M. B. Waite, *op. cit.*, p. 74.

same branch, were distinguishable, he informs us, one from the other. It may be inferred also, from the statements of F. R. Cheshire, that what has been remarked as occurring with the pear also occurs in the case of the apple.*

Similarly, there exist no grounds for concluding that the orange differs from other fruits—including the pear and the apple—in the benefit that accrues in their case generally from cross-fertilisation. If this latter is commonly effected by bees, this favourable result must be attributed to their habit of visiting the flowers; and, further, it must be recognised that these insects not only accomplish a useful act—*i.e.*, pollination—but also the most serviceable form of those processes coming within this definition.

To what has been already stated, of bees in their relation to the flowers of the orange, something further may be added regarding the falling of the blossoms prior to the setting of the fruit, as an event—as is apparently alleged—consequent on the visitation to them of these insects. In the first place, it would be of interest to learn to what extent this has been generally observed. It may, however, be remarked that personal experience would point to the fact that this rarely happens, and that, when it does, the two events have no such connection between them as that of cause and effect.

With regard to the shedding of the fruit in its earliest condition, or, in other words, of the ovary—also attributed to the visitations of honey bees—it may be stated that in the case of the orange that this is effected by a special structural peculiarity, the existence of which determines the more ready happening of this event than would otherwise be experienced. The flower of this plant is, in fact, remarkable in possessing no less than five transverse articulations in connection with it,† at each of which separation of parts may ensue, similar in kind to that which may take place between the leaf-stems of a deciduous tree and the branchlet from which it springs. The zone of separation in connection with the ovary is situated at its base, and as a result of its presence this part of the plant is shed more readily than it would otherwise be. Now, amongst those agencies that contribute to the latter result the following may be specified:—(1) Excess of vigour, such as often occurs in the case of very young trees, which, as is so often remarked, fail to set any of their flowers, or only a very small proportion of them; (2) temporary loss of vigour, such as may result from the presence of unsuitable soil conditions; (3) direct injury, such as may be occasioned by the occurrence of abnormally dry or cold winds. But failure to set fruit is also brought about by reason of the ovules of the ovaries not having been fecundated or fertilised. This is the principal cause of unprolificness on the part of the tree. Now, this lack of fecundation may arise from the existence of more than one defective condition of growth, but especially from the absence of the means for effecting it—*e.g.*, from a failure on the part of insects, including bees, to visit the flowers. Wherefore it may be concluded, from this and the foregoing statements, that bees in so far as they frequent orange blossoms are beneficial to the orchardist rather than prejudicial to his interests.

* *Vid.* F. R. Cheshire: "Bees and Bee-keeping," vol. i., "Scientific," pp. 323-4, London, 1888.

† "Nelle Aurantiaceæ ne troviamo una alla base dello stilo, un'altra alla base dell'ovario, una terza al disotto dei fiori, finalmente una all'apice ed una alla base del picciuolo," O. Penzig. *op. cit.*, p. 77.

Botany.

OUR BOTANIC GARDENS.

No. 2.

By PHILIP MAC MAHON,

Curator.

LET us enter, as before, at the entrance from George street, and with map in hand make our way towards the centre of the Gardens, where we will look at the lily ponds, just now in their full beauty, and which we want to see, particularly as the aquatic plants which we can grow in our country are the admiration and envy of all our Southern visitors. But first, as we pass, have a look at that straggling tree by the railings directly in front of Parliament House (B. 12). It is the Queensland Cluster Fig, or, if you like it better, *Ficus glomerata*. The wood is light and soft, and it has not much industrial value, so far as we know.* It bears fruit most abundantly, and, although not used in this country, it has saved many a Hindoo from death in famine time; indeed Gamble, who is an authority on Indian timbers, speaks of the fruit as being good stewed. A well-known member of our Upper House told the writer that he had eaten them in the bush. But a curious thing about the fruit is a very small fly whom I do not know by whatever long name he bears just at present. If you pick up one of the ripe fallen fruits and break it open, this little fly will pour out of the hollow fruit literally by the hundred. Very active he is, too, though evidently very much astonished to find himself in the light of day. He has a long ovipositor, which he moves about with every appearance of excitement. The Fig is known to the average person as a fruit, and so we speak of it popularly; but it consists of a number of fruits, enclosed in the receptacle, which is fleshy, and which is the part we eat. Now the curious little fly is there for the purpose of fertilising the fruits. Of course he finds his own account in being there. He is not there for any special desire he has to distribute the pollen of the flowers. All Nature is mutually dependent; there is a kind of interlocking as it were, like parts of some elaborate machine. In Syria there is an insect which rejoices in the name of *Blastophaga psnes* better known as the caprification insect, which inhabits the wild fig, and is supposed to effect its fertilisation. At all events, from time immemorial the cultivators have taken pains to artificially introduce the insect to their plantations.

It may be mentioned that this tree is used for the purpose of manufacturing bird-lime from its sap by the Indian bird-catchers. It is quite possible that whilst we are ransacking the forests of the world for India-rubber, some of our own fairly common trees will be found to yield a payable supply.

To the left, a little further on, is a long avenue of the Feather Palm. It may be of interest to visitors to know that these fine palms are only seven years old, which illustrates the manner in which ornamental effects can be secured with these palms in a few years. Halfway between each palm is planted a Weeping Fig, the idea being that by the time the palms tower far upward there shall be a cool colonnade of dense shade below. There is no more beautiful simile in the Bible than that which likens a truly great man to "the shadow of a great rock in a weary land." It must often be brought home with force to the wayfarer on our great Western plains; yet few people seem to plant for that

*The wood of the Fig-tree has, we believe, been used by the Messrs. Grimes for arrowroot cases; and Mr. Benson is of opinion that it might be employed for light fruit cases.—Ed. Q.A.J.

grateful dense shade referred to, found in the open forest where column after column bears aloft its leafy canopy. In the Domain at Sydney something of the sort has been done with some of the figs, and there is nothing more grateful than to plunge into their dense shade after a weary tramp through the hot and dusty streets; it seems like a shade bath. It is hoped to have a cool avenue of this sort in a few years with seats where one can rest and enjoy the cool.

Let us onward; passing the point where we stopped last time we met in the Gardens (F. 11); we bear slightly to the left, and go down a gentle slope. To the left is a border of mixed shrubs. If you are from what we still lovingly call "the old country," you will notice a little way down on your left a plant of the Elder, so dear to the heart of the English schoolboy for the manufacture of his peashooter, and around which so many strange wild legends are grouped, especially in Ireland. To the right is a triangular piece of ground, which is being devoted to palms. Over eighty specimens have recently been planted there—three of each sort. They are just starting into vigorous growth. You may have noticed this of palms more than of any other plant; that after they are planted, they remain without making any growth worth mentioning for a long time, as if they were sulking at being turned out of their snug quarters, and had hardly decided whether to spite you by dying or go on living. But when they do make a start, they grow with comparative rapidity.

A little further down we come to a fine group of the Common Bamboo (D. 6), and beneath them on the corner there is a flourishing Date Palm. Its position illustrates the small amount of sustenance this palm will live upon. Hardly any other plant would flourish in land sucked dry by the roots of the Bamboos. The most famous variety of Date is that known as Tafilat. Introduced to Antigua, it fruited at four and a-half years. In its native country a good tree bears from 150 to 200 lb. per annum. Trees have been known to bear 400 lb. A plantation in full bearing produces 51 cwt. to the acre, and this at, say, £2 to the cwt., would mean that on the London market the produce of one acre would be of the value of £100.—*Kew Bulletin*.

The average value of dates in London is as follows:—Tafilat, 75s. to 81s. per cwt.; Egyptian, 28s. to 45s. per cwt.; Bussore, 13s. to 21s. per cwt.

So well known are the nourishing qualities of dates to the Arab of the desert, that he will start out on a long journey provided only with a little date-flour to sustain him.

On the opposite corner (H. 10) stands the Strychnine-tree (*Strychnos Nux-Vomica*). It is the source of the deadly strychnia. This alkaloid is extracted from the seeds, and has an extensive use in medicine. People used to write to the papers pretty often some years ago, pointing out the fearful results likely to accrue from allowing the fruits of this tree to lie about in the Gardens. Children were in danger of being poisoned wholesale! The fruit is not poisonous, and a child might eat some; but that child would possess a queer sense of taste. If one may judge from one eaten the other day with a view of telling you what it is like as an article of diet, no child would ever get beyond the first bite. It is most intensely bitter, and generally about the most unpleasant thing one can possibly imagine to taste. It is not likely to come into general use as a dessert fruit. Yet the birds devour it in India, and what is more, they swallow the seeds, which do not seem to do them any special harm.

A very close relative of this plant, or, to speak more correctly, several of its close relatives, furnish the chief ingredient of the deadly wourali poison with which the Indian in the deep forests of South America, and along the banks of the mighty Amazon and Orinoco, tips his fatal blow-pipe dart. These are *Strychnos toxifera*, *S. Schomburghii*, *S. cogens*, and other species.

The tree next it hails from a very different part of the globe. It is the Balsam of Peru, formerly shipped from San Salvador in Central America, but now little used in medicine. To your left (G. 9) there is a fine clump of Bamboos. Anyone who knows what an indispensable plant this is to the

dweller in the far East, native and European, must wonder why the Bamboo is not much more employed in our domestic life. It has everything to recommend it for use in many ways. It is light, strong, easily worked. Its flexible skin is shredded off in the East, and worked into hundreds of forms of household convenience and industrial aid. Baskets may be seen woven of it, so perfect that they will hold water. It is frequently said that it quickly decays. Ornamental fences erected here nearly five years ago show no signs of decay. Of course five years is a small time in the life of, say, a hardwood fence, but then these were cheaply and rapidly constructed, and were ornamental screens. To get the same appearance from a hardwood fence would have been a serious matter, both as regards trouble and expense.

It would not be generally supposed that £300,000 worth of walking sticks and canes are imported into England every year, and of these various species of Bamboos form no inconsiderable part. The variety of Bamboo growing in the Gardens has been used with considerable success in the manufacture of paper.

Looking at a tall waving Bamboo as it sways to and fro in the wind, the very picture of lightness combined with graceful strength, you would hardly take it to be a grass. And yet such it is. It belongs to a very large and very useful family, of which there are 3,500 distinct representatives in the world, spreading from the ovenlike temperature of the tropical ravine to the breeziest mountain top.

The rate of growth of the Bamboo is very rapid. There are a few well-authenticated instances. Roxburgh (a most accurate observer) records that one species of Bamboo grew at the rate of from 20 to 70 feet in a month. Fortune says that the rate of growth of certain Bamboos he noted in China was from 2 to 2½ feet in a day.

The introduction of useful varieties of Bamboo from Japan and elsewhere is having our attention.

It may be mentioned that persons about to use Bamboos will find it improve them very much to steep them for a fortnight in water before using. They will last longer and show a firmer grain. The storytellers of the East have a pretty legend about the Bamboo. They say that two lovers were escaping from the usual cruel parent, and came to the banks of a stream, when, as in the case of Lord Ullin's daughter—

Adown the glen
Rode armèd men,
Their trampling sounded nearer.

Then the gods in pity changed the lovers into two Bamboos, and the whispering sound which is heard amongst the leaves at night, when there seems not a breath of air to ruffle a leaf in the sleeping jungle, is the whispered converse of the hapless lovers. You want to hear this story told by some eloquent old professional storyteller in the Bamboo jungle itself, when the camp-fire burns low, and the long mysterious shadows are falling athwart the open glade, to appreciate the beauty and charm of a tropical jungle at night.

The way in which Bamboos have been generally propagated here has been to cut out a shooting head with some roots attached.* This is a somewhat troublesome thing to do, for the Bamboo sticks to its home as a barnacle to a rock. They have been propagated here recently in two other ways: By cuttings of the side shoots; and by laying the trimmed stem in a trench and placing 6 inches of earth on it, if kept moist, it springs up at the joints. This was discovered accidentally in making drains of the stems.

In the pond which is surrounded by these Bamboos you will notice a green surface which most people call slime. It is not slime, but quite an interesting little plant, very widely distributed throughout the world, and, like the ever-present sparrow, possessing a wonderful power of adapting itself to circumstances. When the water sinks away from it, it just takes root on dry land;

* The Bamboos growing at Cadarga, Milton, sprang from a switch cut for a riding cane by Mr. Boyd in 1878.—Ed. Q.A.J.

and instead of being a plant swimming freely in the water, it becomes for the time being a land plant. Our friend the Water Hyacinth, it may be mentioned, has the same adaptability, and there are here some specimens growing on land. Our little plant in the pond is called *Lemna oligorhiza*. After such a name as that it seems a pity to call it a Duckweed. It is closely allied to the Calla Lily (generally so-called).

We pass by smoothly shaven lawns and observe the beautiful turf so different from that of the time, a few years ago, when only scythes were employed to keep a ragged surface, passing a plant of *Cocos Weddeliana*, rather a difficult palm to grow out of doors, but doing splendidly in its jungle-like surroundings, until we come to the Lily Ponds. The first contains the White Nelumbium (*Nelumbium speciosum album*). This is the Sacred Lotus of the ancients. It has long submerged stalks (rhizomes) creeping in the mud at the bottom of deep water, which it likes. These rhizomes send up long stalks supporting the leaves and flowers. The flowers are most beautiful, and to a lover of form the leaves are not less so. They are shaped something like large dinner-plates, and indeed in the East they are sometimes used for that very purpose. It is held in peculiar reverence in India, as it was in ancient Egypt, and much of the inimitable sculpture on Indian temples represents the Lotus. The natives use it in several ways. They eat the creeping rootstock, and it is not at all bad to eat. The flowers are largely used to decorate their temples. How is it that the Hindoo seems to be born with an instinctive love of flowers? It is a splendid bee plant, and swarms of bees are generally found around it. The seeds are made into rosaries which some Indian sects consider very sacred. The leaves when dried are used, in places where they abound, for thatch. The Indian doctor uses it very largely in medicine, and it is said to be really most useful in many cases. For instance, bees fed upon it yield a substance in universal use as a remedy for diseases of the eye. European doctors in India have prescribed various parts of the plant, but chiefly a kind of syrup made from the stalks, as a remedy in fever. The seeds are the Makhana of the native bazaars, and are much used for food.

The fruit is most curious. Somewhere about 1,300 years ago a philosopher of Greece compared it to a wasp's nest; and the description was very accurate. But it is a little strange that here in Queensland, the hornets, who cannot be accused of reading Pythagoras, very often take possession of the empty fruit-head, and use it as a nest. The next pond is full of the English Water Lily (*Nymphaea alba*); and lovely indeed they look just now, dotting the water like silver stars. The rootstock is acrid, and is occasionally used medicinally in India, where it occurs. The edible Chinese rush occurs in this pond. It has to be weeded out every now and then, because it has a habit of spreading out of bounds. The next pond holds the large Blue Water Lily of Queensland, so well known to all. This plant, curiously enough, came up in abundance after the flood of 1893, both here and in the large lagoon, but the swans soon cleared it out of the latter. You cannot have swans and aquatic plants in the same piece of water. The next pond contains the red variety of the Lotus (*Nelumbium speciosum rubrum*). A curious habit of the *Nelumbiums* was shown by these plants. They had not shown above water for several years, certainly for four, and it is said for much longer. After the flood of 1893, this pond was cleaned out, and the *Nelumbium* came up in force. The two *Nelumbiums* can be propagated by portions of the creeping rootstock or by seed. The latter, it is authoritatively said, will germinate after having been kept for forty years.

In the same pond is a specimen of Nardoo (*Marsilea quadrifolia*), upon which Burke and Wills subsisted for a time. This plant grows in swamps which dry up in the hot weather, and the natives then collect the small seed-pods, and grinding them between two specially prepared stones make an apology for a diet. Judging by the seed-pods borne by our plants (which flourish well), it cannot have been a diet of a very refreshing or sustaining nature.

The margins of these four ponds have been planted with Willows of different varieties. One is the golden basket Osier, which seems well adapted for basket-work. It would seem that basket-work is unusually expensive in this colony, due perhaps in some degree to the higher rates of labour, but the hampers, used so universally in England for packing, seem to be almost if not quite unknown here. They are certainly not known in the cheap forms in which they are so extensively known in England. Yet Willows can be grown most readily. They have done well for five or six years, withstanding floods and producing fine straight basket Willows. The large drooping Willow in the centres, between each pair of ponds, is the *Salix Babylonica*, so called because it is conjectured to be the tree upon which the captive children of Zion hung their harps when commanded to sing by their Assyrian masters. Note the great masses of roots which form in the water, and serve to bind together the bank. All these trees, whose natural habitat is by the banks of running streams, help to keep the banks together, especially in time of flood, thereby ensuring their own safety by protecting the bank from being washed away—another example of the mutual co-operation referred to at the opening of our talk to-day.

By the margins of these ponds, efforts are made to encourage the growth of our native riverside grasses, and other native plants which thrive in such places. For this reason the margins are not kept neatly mown, at least until these plants have died down. In the great national gardens at Kew, extensive plots have been laid out in picturesque wildness, and planted with the native plants of Great Britain, and these are most delightful in the spring time when the native plants are chiefly in flower. Of course these spots are railed off from the public, but they are laid out in careless irregularity, winding about so that the people can see every part from the outside.

It is hoped that it may be possible to do something in the same direction for our Queensland plants.

SOWING LOGWOOD SEED.

By PHILIP MAC MAHON,

Curator, Botanic Gardens.

SOME little time ago it was recommended in the *Journal* that persons having business in our tropical scrubs would be doing a valuable work by sowing the seeds of Logwood. The idea seems to have "caught on," and there have been several requests for seeds of this valuable tree from persons willing to sow it either in the scrub or in their own land. Some have asked for simple directions for sowing. There are two methods which may be followed with success. A fine batch of young seedlings has just been raised here by the first method, and experience has shown the value of the second.

1. Take any box about 4 or 5 in. deep, put in the bottom a layer of pot-shreds, or better still, broken charcoal, about an inch deep; spread over this a layer of rough leaf-mould, moss, spent hops, or any material which will prevent the soil from getting down amongst the layer of drainage, and so souring the whole mass. Then prepare a mixture of equal parts of loam, leaf-mould, and sand, mix thoroughly, fill the box to within about an inch of the rim, scatter the seeds over the surface fairly thickly, but not so as to choke the young plants when they come up. If they average one inch apart, an ordinary fruit case will give you 370 plants. As to cover, this is important. If you bury the seeds they will not germinate. Put some leaf-mould—*i.e.*, decayed leaves—in a sieve and carefully sift a fine layer, not thicker than the depth of the seeds themselves. Water with a fine rose; and if, on watering, any of the seeds are exposed, sift a little more leaf-mould over them, but do not bury them above all things. Water when the surface of the box looks dry; keep in a

shaded place. Last year's seed, twelve months old, treated here in this manner about three weeks ago, were up in eight days, and are now ready to "prick off." This should be done in earth with a good admixture of leaf-mould, as this helps them to make fibrous roots. This is best done when the plants are 2 inches high; and when they are about 6 inches high, they will be ready to plant in their permanent positions. Many persons keep transplanted trees too long in the nursery bed. They then receive such a shock on being planted out that they do not readily recover. This is especially true of plants in a tropical climate.

2. For scrub sowing. As you go through the scrub you will doubtless have little time to spare to be very particular about seed-sowing, but if you take a little of the seed in your pocket, and in partial clearings, especially near creeks, throw down here and there a seed or two, and lightly draw a little of the natural surface earth over them with your foot, but still not deeply, you will probably have the satisfaction of seeing Logwood trees of fair size in that scrub before many years. Of course if you are going in for a regular plantation you will clear tracks through your scrub in parallel lines at about thirty feet apart, and have other lines crossing these at right angles, and plant your seedlings at the intersections. This is the plan pursued in the Government forests in India, in planting jungles with valuable trees, such as rubber. It is not the intention here, however, to recommend the expenditure of capital on Logwood.

Fresh seeds will be ready here in considerable quantity in about a month. It may be as well to bear in mind that seeds, &c., are only procurable from the Gardens in exchange for desirable plants or seeds previously presented, except through the Department of Agriculture. Persons who are not willing to ask to be placed on our exchange list, or who cannot offer exchanges, will please apply to the Under Secretary, Department of Agriculture.

BOTANY CONTRIBUTIONS.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

Order FUNGI.

(*Recorded without description in former publications on the Flora.)

UROMYCES, Link.

***U. amygdali**, *Cooke*, Handb. of Austr. Fungi, 331. Uredospores in small hypophyllous cinnamon sori, sometimes confluent, sub-globose, punctulate; teleutospores mixed, or succeeding them, clavate, apiculate, or almost lanceolate; epispore much thickened at the apex, pale, tawny, glandular within, 35 to $40 \times 12 \mu$.

Hab.: On leaves of peach and almond tree, Toowoomba, *H. Tryon*, Brisbane, F.M.B. Attacking the trees only when the weather has caused a stoppage in the growth, most abundant about the fall.

***U. phyllodiæ**, *Cke. and Mass.*, Handb. of Austr. Fungi, 331. Sori minute, orbicular, compact, brown, crowded on elliptic, bullate brown spots, 3 to 5 mm. long, at length naked, not pulverulent. Uredospores not seen; teleutospores elliptic, obtuse, rarely apiculate, brown; epispore minutely warted, rather thick, hyaline, thickened at the apex, 40 to 45×16 to 18μ .

Hab.: On phyllodes of *Acacia*, at Brookfield, Brisbane River.

***U. diploglottidis**, *Cke. and Mass.*, Cooke's Handb. of Austr. Fung., 331. Epiphyllous. Sori scattered, convex, minute, for a long time covered, at length splitting, pallid brown, seated on orbicular greenish spots. Teleutospores elliptic, apex obtusely acuminate, base attenuated into a short pedicel. Epispore hyaline, thick, plasma granular, pallid, 50 to 60×28 to 30μ .

Hab.: On fading leaflets of Native Tamarind (*Diploglottis Cunninghamii*), Woolston Scrub, Brisbane River.

***U. Fabæ**, *Pers.*, Sacc. Syll. vii., 531. Spermogones honey-yellow, conoid, in small clusters on the leaves or stems; æcidia often somewhat distant, disposed in annular or orbicular spots; pseudoperidia cupulate, short, with white lacinate margins; æcidiospores globose or ellipsoid, 16 to 26μ diam., orange-red, finely verrucose; uredospore bearing sori amphigenous, erumpent, orbicular or irregular, rotund, scattered or gregarious, dilute-brown, pulverulent; uredospores globose, elliptical or ovoid, rarely pyriform, 17 to 35×17 to 25μ , aculcate, ochraceous; teleutospore bearing sori hypophyllous, subrotundate, oblong or elongate, often confluent, dark-brown, somewhat smooth; teleutospores ovoid or clavate-ellipsoid, apiculate; epispore vertical measurement 6 to 9μ , thick measurement 24 to 47×17 to 30 , smooth, chestnut-brown, apex obscure, pedicel hyaline, 110μ long, persistent.

Hab.: On leaves of the common broad bean, Gladfield, *C. J. Gwyther*.

U. fusicusporus, *Cke. and Mass.*, Handb. of Austr. Fungi, 331. Sori discoid erumpent, black, girt by the ruptured cuticle; uredospores globose, shortly stipitate, even, brown, 35 to 45μ diam.; teleutospores mixed, fusiform, with a hyaline apiculose; epispore obtusely warted, brown, 60 to 70×25 to 30μ .

Hab.: Islands of Torres Straits, June, 1897, on the phyllodes of *Acacias*.

PHYLLOSTICTA, Pers.

P. acaciæ, *Cooke*. On both surfaces of the phyllodes, spots elongated, elliptical, or linear, limited by the veins, greyish with a pitchy brown margin, or wholly fuscous dotted with the minute black perithecia. Sporules narrowly elliptical, 10×1 to 2μ hyaline.—*Dr. Cooke in letter*.

Hab.: Islands of Torres Straits, on the phyllodes of *Acacia*, June, 1897.

***P. neurospileæ**, *Sacc. and Berl.* Spots on the upper surface, limited by the nerves, hence angular, reddish ochraceous; perithecia globose-depressed, very few, innate, rather prominent, punctiform; sporules ovate-oblong, 8 to 10×5 to 6μ , granulose within, hyaline, on short basidia.—*Cooke's Handb. Austr. Fungi*, 346.

Hab.: Logan River, on leaves of *Vitis antarctica*, *Rev. B. Scortechina*.

***P. cordylines**, *Sacc. and Berl.* Spots vague, becoming pale; perithecia on the upper surface, close, punctiform, globose-depressed, pierced, 60 to 90μ diam.; sporules oblong, biguttulate, 4 to $5 \times 1 \mu$.

Hab.: Tambourine Mountains, on leaves of *Cordyline terminalis*, *Rev. B. Scortechina*.

***P. palmicola**, *Cooke*, *Grev.* xiv. 89. Spots irregular, amphigenous, whitish-grey, margins brown, slightly raised; perithecia sub-innate, black, minute, pierced, oftentimes very numerous; sporules elliptical-cylindric, hyaline, $5 \times 2 \mu$.

Hab.: Daintree River, on the leaves of young palms.

A NEGLECTED NATURAL PRODUCT.

THE EAR FUNGUS: A CHINESE SOUP PLANT.

(See PLATE.)

THE accompanying illustration represents a fungus of more than ordinary commercial importance, and one which is very abundant in most of our scrubs on logs and fallen branches. It seems to be partial to trees of the Nettle Family; thus is often plentiful where these trees abound. In England the Rev. M. J. Berkeley tells us that it is most abundant on the elder, but is occasionally found upon the elm. At one time this fungus had a reputation for medicinal virtues, particularly as an ingredient in gargles, which may have arisen from the resemblance of the hymenium to the fauces. The great market for this product is China, where it is used for compounding those gelatinous dishes of which those people are so fond. The Chinese mode of cultivating this plant is to cut down small trees of their oak (*Quercus sinensis*), and cut them into poles from 6 to 10 ft. long and 3 to 6 in. diameter; these are left to rot on the ground for a year. In the following spring, when the wood has become more or less rotten, the poles are erected into a kind of shed, when the fungus springs spontaneously from the bark in all directions, and continues to produce crops of the fungus for about two years. Dr. M. C. Cooke (from whom I quote) says that the price paid to collectors for this product is 1d. to 2½d. per lb.; that New Zealand exported between the years 1872 and 1883 no less than 1,858 tons, valued at £79,752. Chemical analysis proves it poor in albuminoid or muscle-forming substances; thus it will only find favour as a food with people, like the Chinese, fond of the mucilaginous property with which this fungus abounds. The fungus belongs to the genus *Hirneola*, of which the species common to Queensland scrubs are—*H. auriformis*, Schw.; *H. polytricha*, Mont.; *H. auricula-Judaæ*, Linn.; and *H. rufa*, Berk. All these might be collected, for the distinction between them is very slight, and only observable to the mycologist. The most plentiful is *H. polytricha*, which is also the most abundant in New Zealand.

PLANTS REPUTED POISONOUS TO STOCK.

PRICKLY LETTUCE; OR *LACTUCA SCARIOLA*, LINN.

(See PLATE.)

THIS European weed, which some ten years ago overrun the farms of the Rosewood district, has during the past few months obtained a good footing in the enclosed land about the Central Railway Station, and, if nothing is done to check it, we may next season expect to see all vacant spots in and around the city covered with the pest. This and its close ally, *L. virosa*, or Acrid Lettuce, yield a kind of opium. When so abundant at the Rosewood, it was thought to have caused the death of several cows.



EAR-FUNGUS.
A Chinese Soup Plant.



PRICKLY LETTUCE.

Economic Botany.

No. 4.

NGAI OR AI CAMPHOR (*BLUMEA BALSAMIFERA*, DC.).

By J. F. BAILEY.

Derivation.—*Blumea*, after C. L. Blume, a celebrated botanist. The specific name means balsam-bearing.

Description.—An evergreen shrub of the Aster Family (Compositæ), sometimes growing into a small tree. Stem shrubby at the lower part, branches woolly villous. Leaves, which smell strongly of camphor, oblong or elliptic-lanceolate, toothed on the margin, with narrow lobes in the lower part, thickly clothed with silky hairs. Flower-heads rather small, shortly stalked, forming smaller or larger panicles in the axils of the upper leaves and gradually transformed into terminal large panicles; florets yellow, numerous in each head. Seeds (achenes) minute, the pappus or down soft, about a quarter of an inch long and of a reddish colour.

Very abundant in India, South China, and the Islands of Hainan and Formosa.

Cultivation.—The plant should succeed in most parts of the colony. It may be propagated from cuttings or raised from seed in a bed set apart for the purpose. When ready for planting out, plant in rows 8 feet apart, giving a space of 4 or 5 feet between each plant.

Uses.—Dr. A. Henry, according to Hooker's "Icones Plantarum" (from which excellent work the accompanying plate is taken), says that from this plant is produced in Kwangtung and Hainan the peculiar camphor known to the Chinese as *ngai-fên*, signifying the crude product, and *ngai-p'ien*, the name given to the refined article. The export from the port of Haihow to Hainan of the crude camphor is about 15,000 lb. annually. This is refined in Canton, from which there is an annual export of about 10,000 lb. of *ngai-p'ien*. Loureiro mentions its use in Cochin China as a stomachic, anti-spasmodic, and emmenagogue.

It is also used in the manufacture of the scented kinds of Chinese ink. Ngai camphor fetches a much higher price than ordinary camphor.

Preparation.—In a letter to the Royal Gardens, Kew, Dr. A. Henry gives the following description, obtained from the Rev. F. P. Gilman, of the process employed by the Chinese in extracting the camphor from the plant in the Island of Hainan:—The plant is in flower in July and August. During the fall and winter months the Chinese of the island, or the aboriginal Loïs in Chinese employ, collect the young leaves of the plant, which there grows to a height of 8 or 10 feet. They say they only take the last three joints of the branch. The leaves are allowed to remain on the branch, and are wilted for a couple of days. They are then placed in the retort, which is a cask about 2 feet high, open at both ends, and of a diameter suitable to place it over a large Chinese frying-pan (say the diameter is 20 inches). The frying-pan is filled with water, and over the water is placed a coarse sieve of woven bamboo to separate the leaves from the water. The cask is cemented with clay to the edge of the pan, and after receiving its charge of 30 lb. or 40 lb. of the leaves, a large brass basin is placed on the upper open end of the cask, and is filled with cold water which is frequently changed. Fire is placed under the frying-pan, and the process of distillation is continued for about four hours. At the

end of that time the brass pan is lifted off, and its lower surface is found to be coated with a layer of crystallised substance about the sixteenth of an inch thick. This is the *ai-fen* or crude camphor, and is sent to Canton, and remanufactured into *ai-p'ien* or refined camphor.

Another writer gives the following as the processes of preparation:—(1) A large pan or cauldron is filled with water, and a tin or can without a lid is set upright in it. This tin has a small aperture beneath, into which is fitted a metal tube. The plant is put into the tin, and a second iron pan put over the tin like a cap. This pan has an aperture through which issues the tube leading from the can. The water is made to boil, and the steam, having no other means of egress but the tube, passes through the can and out of the covering iron pan, steaming the plant on its way, and condensing as "*ai dew*." (2) In the second place, the "*ai dew*" is put into a tin or can which has no orifice in it, and, with that variation, treated as before. The product is called *ai fen* (or "*ai flour*" or "*powder*"). (3) The "*ai powder*" is treated according to the first of the three processes, and the essence thus distilled is the fragrant *ai yu* or "*ai oil*."

EXPLANATION OF PLATE.

- | | |
|-------------------|--------------------|
| 1. Capitulum. | 4. Seta of pappus. |
| 2. Female floret. | 5. Anthers. |
| 3. Disk floret. | 6. Stigma. |

Enlarged.

THE *PHASEOLUS SEMI-ERECTUS*, OR INDIGO PLANT.

By DANIEL JONES,
Department of Agriculture.

THE mysterious operations of natural forces demonstrated by the investigations of plant existence will ever indisputably remain one of the most interesting forms of scientific research. Thus, in the march of science, new ideas have perforce to succeed older ones as the master mind of man penetrates keener than ever Nature's hidden mysteries; and despite the jealous care with which she enwraps her truths, the solution of problems affecting the laws of plant life is daily becoming less abstruse; and as light gleams on the subjects, the marvels of Nature are presented in newer and more fascinating forms. Some will well remember how a few years since, when the important surmises of Berthelot and the subsequent discoveries of Willfarth and Hellriegel were outlined to the scientific world, and how the ascertained facts became the butt for jokes and hilarity. Now, the so-called new-fangled theories in this, as in many another scientific subject, have outgrown the environment of the prejudiced mind, and stand as a splendid fabric on which are demonstrated many problems that heretofore were but within the undefined field of conjecture. Thus to home agriculturists, any possible indication of useful enlightenment that carries with it a probability of easy local demonstration of the utility of these discoveries, can but result in additional interest or service to the home farmer.

The presence of this *Phaseolus* in many of our coastal districts, and which is sometimes designated Indigo, has proved very embarrassing to the farmer. Given a good start and it quickly ranks amongst the most persistent and prolific of our weeds, and undoubtedly is a most formidable plague to eradicate once it attains footing. One of our greater poets, in a splendid vein of philosophy, once wrote of Satan, "That he exists for some good, by us not understood." This also may truly have been the philosophy of my friend who, writing of nut-grass, in palliation averred its value as an increased stimulant towards thorough cultivation. Farmers in our district, although looking with scant favour on the presence of this weed (*Phaseolus*), have for long recognised some merit attached to it. At certain stages of growth, when not too rank or wiry, it has



BLUMEA BALSAMIFERA, DC.

often been cut for fodder; my own experience is that, when cut in its succulent stage and well cured, horses and cattle will pick the *Phaseolus* and leave other good fodder. Some farmers have given this plant the name of Native Lucerne; hence, perhaps, the practice I have occasionally known to be adopted of cutting this plant as a substitute for lucerne, which it in some stages of growth somewhat resembles. Our observant farmers have, moreover, noticed that a crop succeeding a plot where this plant has been rampant has disclosed a notable yield on that particular area. My object in presenting these characteristic features is but to seek the services of our agricultural scientists to investigate the qualities this plant may probably possess as a nitrogen-former, and determine, if possible, the similarity in character of this species of those Leguminosæ which have the characteristic root tubercles, at certain stages of development, which Willfarth and Hellriegel and a host of subsequent investigators declare produce the nitrifying bacteria necessary for the fertility of soils, and whose functions are to assimilate or prepare in some form, yet obscure, the fertilising elements best fitted to accelerate the growth and ultimate yield of the crops. Judging from observation of the habit and growth of this plant, I am convinced that, whatever may be its demerits in impeding cultivation (and all who have had to contend with its aggressiveness, will admit its vigour), it has some hitherto unsuspected value in adding fertility to worn-out lands. I find it more persistent in such soils, but not perhaps so rank of growth as in richer areas. Whether further investigation into the merits of this plant will lead farmers to look with less disfavour upon its presence or not, can only be determined by scientific investigation. Should the plant, as may reasonably be surmised, hold a place in the economy of Nature such as other legumes are known to do, this hitherto unwelcome species may yet be regarded as a friend in disguise, and prove to be of "some good as yet by us not understood." Perhaps our friends at the Agricultural College will set their attention to determine what value there is in this plant, and perchance, following these lines of investigation, fall upon other facts or discover new forms of flora that Nature providentially places at our service to make somewhat easier the perplexing path of farm practice. The similarity of root tubercles peculiar to this plant, coupled with its true leguminous type and the evident improvement in succeeding crops, indicate its value as a nitrogen gatherer or former, and may yet establish its value as a new and useful plant in the realm of agriculture. Through the kindness of our esteemed Colonial Botanist, Mr. F. M. Bailey, I herewith append his description of the plant:—

PHASEOLUS, Linn.

P. semi-erectus, Linn. (*P. psoraleoides*, W. and A.) A tall shrubby, suberect plant, with flexuose terete branches, clothed with long deciduous deflexed hairs. Stipules 4 or 5 lines long, lanceolate-setaceous leaves, petioles exceeding 2 in., leaflets 3, entire, membranous, soon glabrescent, the end one ovate, acute, or subobtus, 2 or 3 in. long, often deltoid at the base. Peduncles reaching 1 ft., and the raceme $\frac{1}{2}$ -ft. long, bracteoles setaceous; pedicels short, in pairs. Calyx tubulosa-campanulate with aristate teeth, about $\frac{1}{4}$ -in. long, split open by the pod. Corolla deep purple* and white, 3 or 4 times larger than the calyx. Pod 3 or 4 in. long, about $1\frac{1}{2}$ lines in diameter, rarely recurved, many seeded; seeds when ripe of a reddish colour.

I met with the plant over thirty years ago at Hill End, South Brisbane. It is noticed in my publication as *Phaseolus psoraleoides*.

On the subject of nitrate-forming bacteria, the *Californian Fruitgrower* says:—

The leguminous plants, such as clovers, peas, beans, peanuts, vetches, and the like, are valuable for renovating the soil, in that the free nitrogen of the air is made use of in their growth and stored up in their roots. It has been

pretty clearly demonstrated that this peculiar property is due to bacterial life found in the nodules or little knots on the roots. Consequently the more numerous the nodules, the greater the capacity for collecting nitrogen and enriching the soil. At the Louisiana Station (says *Orange Judd Farmer*) it was found that cow peas planted 2 and 3 inches deep produced the greatest number of roots and tubercles. Below 3 inches the root system was less extensive and the plant less vigorous. Roots penetrating directly downward were generally free from tubercles at a depth of 10 or 12 inches, or soon after the root gets into compact clay. The nature of the soil has much to do with tubercle formation. In cultivated soil the nodules will be found on all the roots, while in a compact field they will be confined to roots near the surface. They are also found at a greater depth in a sandy than a clay soil, and where deep cultivation is practised than where shallow prevails.

Other experiments indicated that each plant, or at most each genus of plant, will support but one kind of parasitic organism capable of developing tubercles on its roots. For example, a peculiar organism must be present in the soil to produce nodules on alfalfa. Any quantity of cow peas or other leguminous plants will not furnish that organism. The cow pea likewise has its peculiar parasite. The organism to produce the tubercle must be in the soil before the seed is sown. Just why they are present in some places and absent in others, is not quite clear. Tests are being made to determine the practicability of inoculating the soil with special organisms or germs, thus making it possible to grow legumes on land heretofore unproductive for this particular crop. Results so far indicate that this is one of the possibilities, but more investigation is necessary before a definite statement can be made.

Tropical Industries.

RAMIE CULTIVATION.

WE abridge from the *Tropical Agriculturist* (Colombo) the following somewhat conflicting estimates of working expenses and profits of a ramie plantation:—

Mr. L. Wray, junr., prepared for the Perak Government all available information respecting the yield per acre, the cost of harvesting and preparing, and finally the value of the result. He finds the mean yield of fibre per acre to be 1,173 lb., and of ribbon 1,656 lb. Then, as to cost. Very little is to be found in any of the accounts of ramie of the cost of the cultivation. It is variously stated that one coolie can keep in order 2 to 3 acres of land, but there is nothing on which to base an estimate of the cost of harvesting and preparing the crop.

Taking two coolies to 5 acres and the wages at \$9 per month, the cost per annum is \$43·20 per acre, and per ton of ungathered ribbon \$58·45. Considering that 15 tons of stalks have to be treated by acre, Mr. Wray does not think that less than \$20 could be allowed per ton of ribbon. This would bring up the cost of the ribbon to \$78·45 per ton, or \$57·98 per acre.

There are then supervision, manure, rent, duty, and buildings. The least that can be allowed for this is \$10 per acre per year. Taking a 500-acre estate, this would be made up as follows:—

Rent at 50 cents per acre ...	...	...	\$250
Supervision, \$300 per month ...	...	...	3,600
Manure	...	...	500
Upkeep of buildings ...	...	...	250
Duty on 369·5 tons, at 2½ per cent. ...	...	...	623
			\$5,223

The final cost of the ribbon would be \$91·97 per ton, or \$67·98 per acre.

Summing up as to result, Mr. Wray is not encouraging:—

Dr. D. Morris, the assistant director of the Royal Garden, Kew, in a lecture delivered on the 30th November, 1896, gives the price of ribbon as £8 per ton in London. It does not appear that more than £7 (\$67·20) per ton could be reckoned on; and as, by the above estimate, it would cost to grow and prepare \$91·97 per ton, it would appear that there is a loss of \$4·77 per ton, or \$18·30 for each acre of cultivation.

A reply to Mr. Wray's report came from Mr. E. Mathieu, of Singapore, who quotes actual experiments made for two years at Buitenzorg, Java, under the control of the director of Botanic Gardens:—

One bhow (1¼ acres) gives four cuttings in one year, weighing in the aggregate 34,000 kilos (74,800 lb.) of green stems without leaves and topped.

One acre gives 42,800 lb. stripped and topped.

Mr. Mathieu then quotes a series of American experiments, the result of which is shortly :—

Countries.	Number of Years' Growth.	Number of Cuttings per Year.	Weight of Stems without Leaves and Topped per Cutting per Acre.	Weight of Stems without Leaves and Topped per Acre and per Year.
			Lb.	Lb.
Java	2	4	10,700	42,800
Louisiana... ..	3 to 4	2	12,880	25,760
Texas	„	2		
California—Kern Valley ...	„	4	12,600	50,400
Algeria	4	3	11,013	33,040

Mr. Mathieu is inclined to think that after three to four years a ramie plantation in Malaya should give in four cuttings 20 tons of stems per acre per annum. Such an estimate we (*Tropical Agriculturist*) consider most unreliable to work on as a permanency, even on the richest soil and with the best possible cultivation. Mr. Mathieu next proceeds to lay down the cost of producing 1,680 lb. of clean dry fibre per acre, worth £24 in London.

This he totals up to \$137·70 as a maximum, leaving a net profit per acre of \$102·30 (about £10 5s.) ; but he also shows how, by the planter partially degumming the fibre himself, an additional profit of \$34 20 per acre can be made, thus bringing his total net profit per acre to \$136·50 or £13 13s. (English).

Finally, amongst the papers is an estimate from Mr. J. MacDonald (of MacDonald, Boyle, and Co., London) of the machinery necessary to decorticate and degum the produce of 1,200 acres of land, and of the profits to be made after putting the ramie through all the processes necessary to render it fit for the manufacturer, in which condition it will readily command £42 per ton in Great Britain. In France, as much as 2 francs per kilo (equal to about £90 per ton) have been offered, &c., &c.

We may as well put Mr. MacDonald's sanguine figures on record, though we fancy few practical planters will put faith in those referring to return on working of estate:—

Estimate of Cost—900 Acres under Cultivation.

Machinery	£6,775	0	0
Cultivation: first twelve months' expense			
after planting*	£3,208	5	0
Cost of six months' treating the fibre, say 156			
working days	3,269	12	0
	£6,477	17	0

* The cost of land, of plants, clearing and breaking up ground, enclosing, and planting ar wanting in this estimate.—Ed. Q.A.J.

Return from Estate, first year.

At the end of the first year the product may be estimated at at least 450 tons of cleaned fibre, ready for the manufacturer. Taking the sale price of this at only 4½d. per lb., it amounts to ...						£18,900	0	0
Cost of producing the above as on the other side						6,477	17	0
						£12,423	3	0
Freight at £2 per ton ...						£900	0	0
Brokerage and incidentals, 2 per cent.						260	0	0
						1,160	0	0
Working profit						£11,263	3	0
For the second year the yield is estimated at 1,350 tons, value						£56,700	0	0
Cost of production						13,552	7	0
Working profit						£43,147	13	0

From these working profits, 25 per cent. patentee's royalty will have to be deducted.

For the present we would only note one little point of discrepancy. Mr. Mathieu, writing on actual experience, bases his estimate for Malaya on a three and a-half to four years' old ramie plantation. Mr. MacDonald begins operations six months after planting! It is a pity that planting opinion should, we feel, be prejudiced at the very outset by estimates and figures which seem to us far too glowing. Far better pleased would practical men be to see a well-considered moderate statement work out a possible profit of £5 per acre, than to be met with £12 profit per acre the first year, and well-nigh £50 in the second year, from a cultivation which, so far as we know, no one has yet tried on a scale sufficiently large to justify reliable estimates for a plantation at any rate in the Eastern world. Garden estimates are useful as guides, but they do not count for serious estimates on a big scale with experienced tropical planters.

Since the above was written we have seen it stated that Mr. MacDonald has arranged with a native Sultan (Datu Mahommed) to put 1,000 acres under ramie, and that a central factory is to be erected to treat the product after the MacDonald-Boyle process. This undertaking and experiment will certainly be watched with the greatest possible interest. Mr. MacDonald has a wide margin to work on, and we wish him all success.

COFFEE PROSPECTS IN QUEENSLAND.

WHILST all who are interested in the success of experiments in agriculture which may have the effect of opening up new and important industries, such as rubber, coffee, canaigre, sisal hemp, &c., will hail as benefactors to the colony those who expend thought, time, and capital on these experiments, it is always as well to consider the possibilities or the risks that lie ahead of the pioneers of any one industry.

Let us consider the position held by coffee in the world's markets. The cultivation of this berry has been entered upon in Queensland on a moderate scale, with every prospect of success. All experiments, both in State nurseries

and by private individuals, have shown conclusively that the climate of North Queensland is eminently suited to the requirements of the coffee plant. The soil suits it; the rainfall is sufficient, and occurs at the right periods during the bearing season. The facilities for marketing are good, and the demand for coffee in the Australasian Colonies is such as to afford a certain market up to a certain point; and that point is, the quantity which can be consumed in the colonies. When that point is reached, as now soon will be in the case of sugar, the question will arise, "Can Queensland compete with countries such as Brazil in exporting coffee?"

The coffee production of the world amounts to 11,000,000 bags. Of this quantity, Brazil alone produces 7,000,000 bags—that is, about three-fifths of the world's requirements—leaving 4,000,000 bags to be supplied by Africa, Arabia, the East and West Indies, Central America, Fiji, &c., &c.—all countries, be it observed, where labour is cheap and plentiful. Now, this means a fight for Queensland. The raw coffee sold at landing in London ranges from 40s. to 135s. per cwt.—

African	...	...	...	...	40s. to 55s.
Costa Rica, good	...	...	...	...	52s. to 98s.
„ fine to finest	...	...	...	...	101s. to 118s.
East India, good to finest	...	...	...	...	81s. to 120s.
„ triage	...	...	...	...	68s. to 90s.
Guatemala, good to fine	...	...	...	...	56s. to 110s.
Jamaica	...	...	...	...	61s. to 130s.
Mocha, good to very choice old	...	...	...	96s. to 108s.	to 135s.
Mysore, good to medium	...	...	...	...	86s. to 103s.
„ fine to finest	...	...	...	106s. to 113s.	to 130s.
„ triage	...	...	...	...	88s. to 103s.
New Grenada	...	...	...	...	68s. to 112s.
Plantation Ceylon	...	...	...	...	107s. to 128s.
Santos, good to fine	...	...	...	...	42s. to 66s.
Vera Paz	„	...	...	...	96s. to 115s.

The average prices being—For good coffee, 71s. per cwt.; for fine, 103s.; for finest, 107s.; and for choice old Mocha, 135s. Queensland growers might expect to obtain a price which would probably be the average of that obtained for the three first qualities, or 93s. per cwt.; choice Mocha being unlikely to be produced here in any quantity. Experts give the yield of coffee beans (*i.e.*, the finished article ready for market) per acre in North Queensland at about one ton per acre of 889 trees, of a value at the above estimate of £93 per ton. According to some experts, the cost of picking in Queensland amounts to $\frac{1}{2}$ d. per lb. of berries, or 3d. per lb. of clean coffee, assuming the average return to be only $2\frac{1}{2}$ oz. of clean coffee from 1 lb. of berries. One ton of clean coffee will therefore cost £28 for picking. Taking the sale price at 8d. per lb. (£74 13s. 4d. per ton), and deducting the cost of clearing, fencing, planting, cleaning, pulping, hulling, grading, bagging, carriage, freight, commission, interest on outlay for four years, interest on outlay for machinery, &c., &c., it would be of much value to intending planters to be informed by some competent authority how much of the £46 13s. 4d. (balance after deducting cost of picking) would be left as absolute profit at the close of the season. For manifestly it is on this profit that the planter must depend for his living. As far as labour is concerned, the population of Brazil is 16,500,000. One-half of these are whites, the remainder being made up of negroes, Malays, and Indians. There is no lack of labour, and of very cheap labour. In Queensland there is no cheap labour. Kanaka labour is not cheap—it is merely reliable. Mr. Buchanan, manager of the State Nursery, Mackay, says: "I do not think the kanaka will ever make a coffee-picker." Mr. Cowley, manager of the State Nursery at Kamerunga, Cairns, says: "A white labourer, in a day of ten hours, picked 90 lb. of ripe berries."

Mr. Hepburn, an ex-West Indian coffee-planter, says: "With a full crop in the first picking a maximum of 140 lb. might be expected by a youth with sharp eyes and nimble fingers."

Now we will take Mr. Cowley's statement as correct, because the work was actually performed under his supervision. Ninety pounds of ripe berry will produce about 17 lb. of pure coffee. At 3d. per lb. this equals 4s. 3d. for the white man's day's work of ten hours. The question then arises: Will white men work on coffee plantations for 4s. 3d. a day (rations probably not included)? or if not, will it pay to give them 5s. 3d. a day? This is where, it appears to us, the labour problem will come in.

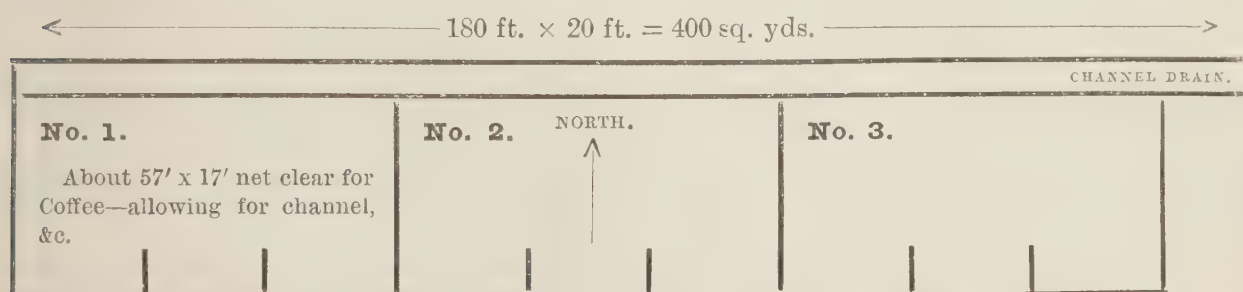
There is another point in connection with coffee-picking which we should like to draw attention to. Coffee berries do not all ripen at the same time. Pickers, if not careful, will often pick green berries as well as ripe ones. It is all the same to them, if paid by weight; but it is a serious loss to the planter. Even if a fine were inflicted for picking green berries there would still be loss, as the picker, although he would not bring in berries carelessly picked, would drop them on the ground and trample them in to save being fined. Thus calculations as to cost of picking must be unreliable for this and other reasons.

We know to a penny the cost of coffee-planting in foreign countries and in other colonies of our own; but no Queensland coffee-planter (and there are a few now) has laid down (outside of a prospectus) the actual cost of planting one acre of coffee, and the net profit or loss resulting from his operations. Many persons would go into coffee-growing if they could only get reliable statistics. We shall be glad to publish any article by an acknowledged expert in the business, which will give the information we have indicated.

Mr. F. Hepburn, whose article on coffee cultivation in Queensland was published in Part 6 of this *Journal*, forwards the following estimate of the cost of sheds and appliances for preparing the bean for market, premising that the shape and positions of barbecues or drying-grounds will vary, but the area and price of materials will be relatively *pro rata*, or nearly so:—

COMPARATIVE ESTIMATE (50 Acres of 800 Trees per Acre) for BARBECUES and SHEDS—or TRAYS and SHEDS.

Barbecues.—Concrete flooring* with brickwork dividing walls, convex at top, also other raised dividing walls and concrete steps, are required—on sloping ground—with sunk channelling covered with grating, or open, as may be required; also, concrete sloping entrances from the barbecues to the door of each shed, to enable the coffee to be quickly pushed under cover with the usual rake made of a piece of wood about 16 in. × 5 in. × 1 in.—or use wooden shovels.



Sheds to be erected alongside Barbecues on this—SOUTH side.

The area above is for a full crop = 3 lb. parchment over 50 acres, or 40,000 trees = total parchment, 120,000 lb. For the first crop, only Barbecue No. 1 would require to be provided, subdivided into three sections by temporarily laying on surface necessary lengths of suitable timber. The coffee

* The concrete barbecues are subject to be undermined by vermin.

is supposed to be spread on an average 1 in. deep. If spread $1\frac{1}{2}$ in. or 2 in. deep, less barbecues would be required, but a correspondingly longer time required to dry, and the longer the time occupied by each drying—say, over $3\frac{1}{2}$ days—the more the *quality is liable to suffer*. Owing to the changeable climate of Queensland, every facility for quick drying should be taken advantage of.

	£	s.	d.
(a) Cost of 400 square yards of barbecues completed as above is very difficult to estimate—would likely average from 12s. 6d. to 20s., say 16s. per square yard	320	0	0
Sheds, about 180 ft. long × 8 ft. wide, with timber flooring	100	0	0
Rakes—12 patent rakes run on galvanised iron rails—on galvanised hoop iron sleepers—3 parallel lines running full length of each barbecue, costing, total ...	15	0	0
Total cost for full crop	435	0	0
Outlay for first crop (one-third only)	145	0	0
Balance—for second crop	£290	0	0
(b) Improved System—Hepburn's Patent Sun-drying Apparatus:			
189 galvanised iron trays perforated all round and lined with perforated zinc, at 15s. ...	141	15	0
189 stands at 2s. 6d. (£23 2s. 6d.), and 21 patent rakes at 10s. 6d. (£11 0s. 6d.), ...	34	13	0
Sheds, about 128 ft. × 7 ft. (no timber flooring), about	43	13	6
Total	£220	1	6

Of this total £220, about £75 required for first crop—the balance £145, for second crop.

The relative cost for smaller areas would be almost *pro rata*. There would, however, be a slight advantage in favour of the larger areas cultivated. On a small estate, with 1,900 trees, three trays and two rakes would dry the first crop; with six trays more—in all, nine trays and two rakes—a full crop could be dried. The rake used on wet coffee beans should not be used on the beans in a dried state. Two rakes are thus the minimum number, but each rake is sufficient for nine or ten trays.

Fiji and other island coffee, of low grade and badly cured, is landed and sold in Sydney wholesale at $7\frac{1}{2}$ d. to 9d. per lb. clean coffee. Queensland clean coffee, when properly cured, would bring in the Sydney market 9d. per lb. or more. If we were competing in Sydney against Fiji coffee, the latter would drop in price, and probably 8d. might be the best price to be obtained for Queensland coffee. This, however, is anticipating by a few years.

No coffee has been grown yet on a sufficiently large scale, or under such approved conditions and economical management, as to give correct data to closely estimate the net profit on any given area. The local price given by the merchants for parchment-cured coffee in the beginning of the year (1887) was 9d.; it now averages 8d., and less when improperly cured. No approximate estimate can be given as to the price to be obtained in London. The Agricultural Department obtained advice on two parcels shipped last year—average value, 40s. per cwt. The curing was in fault.

ON FIBRES.

Now that inquiry is being made into the value of Sisal hemp as a commercial agricultural product, it is well that as much information should be gained as possible on the subject. We, therefore, republish a most interesting and valuable article by J. Medley Wood, Botanic Gardens, Durban, which lately appeared in the *Natal Farmer's Magazine*, and which gives an account of other useful hemp-producing plants as well as of the *Agave sisalana*:—

Judging from the inquiries now being made about fibre-yielding plants, it would appear that at last there is some chance of this industry being commenced in the colony, the chief reason being the invention of a machine or chemical process, or both, which has proved successful in extracting the fibre from the China grass (*Boehmeria nivea*). I know nothing of this process but what I have seen in the Natal papers, and my object at present is merely to give a little information about those plants which seem to be most likely to succeed as fibre-producing plants in our colony. Numbers of indigenous plants have been proposed and experimented on for this purpose, and in time to come it may be that some of them will be found worthy of attention. I shall, however, confine my remarks to the following six:—Rhea or China grass (*Boehmeria nivea*); in-Sangu, or native hemp (*Cannabis sativa*); um-bogozembe (*Urera tenax*), *Gompho carpus*, *Physo carpus*—all of which yield the fibre from their inner bark; Mauritius Hemp (*Furcræa gigantea*); and Sisal Hemp (*Agave rigida*, var. *sisalana*), in which the fibre is found on the leaves.

RHEA, RAMIE, OR CHINA GRASS.—This is a shrubby plant, native of tropical Asia, and has been cultivated for its fibre for a great length of time, but up to quite lately no machine or process has been devised for extracting the fibre at a sufficiently low cost. The difficulty appears to be the presence of a gummy substance which prevents the fibres being separated, except at a ruinous cost in labour, or at a serious loss and damage to the product when machinery or chemicals have been used. This difficulty appears now, however, to have been overcome, if recent statements are to be believed. The plant is a small shrub growing about 3 or 4 feet high, and throwing out numerous suckers, about as thick as a finger, and from these the fibre is obtained. It is said that three crops may be obtained annually in a favourable soil and climate, and that the fibre differs in value and fineness according to the age of the stem from which it is taken, the young and quickly grown stems yielding the finest and most valuable fibre. As to the cultivation of the plant, the *Kew Bulletin* for 1888 says:—"The plants are exceedingly easy of cultivation and thrive in all soils, but preference should be given to those of a light loamy character. *It is essential that the climate be moist and stimulating* in order to produce abundant and frequent crops of stems. The plant may be raised from seeds, but the more ready method is by root or stem cuttings. The roots being perennial, the stools become stronger and more vigorous every year, and from these fresh sets are easily obtained for extending the cultivation."

In looking over the above extract it appears to me that the words italicised require careful attention, especially considering the climate of which the plant is a native. At the conclusion of an article on trials of machines for preparing this fibre, which appeared in the *Kew Bulletin* in 1889, Mr. D. Morris, assistant director of Kew Gardens, says:—"Important elements in such production would be to plant ramie only in places where the soil and climate will allow of three or four crops to be reaped per annum; where labour is very cheap and abundant, and where good facilities exist for transport and shipment." Baron Mueller says of it:—"Ordinarily three crops can be obtained, four in California, and that in Assam, even four to six crops are cut annually, that obtained in the cool season providing the strongest fibre; the latter attains sometimes the length of 6 feet. The produce of an acre has been estimated at 2 tons of fibre, which is always obtained from the young shoots." He also says that the ordinary market value of the fibre is about £40 per ton. I fear, however, that both these estimates are excessive.

NATIVE HEMP.—In my report for the year 1886, the following passage occurs:—"A number of specimens of fibre obtained from indigenous plants were sent from Natal to the Colonial and Indian Exhibition, and amongst them was one which at first was said to have been sent by Sir J. Bissett, and labelled 'Hibiscus.' Experts at home questioned its having been obtained from an *Hibiscus*, and a specimen was sent to me to try to discover from what plant it was really obtained. Upon inquiry, and after receiving specimens of the plant from Sir J. Bissett's manager, it proved to be *Hibiscus tiliaceous*, and was quite unlike the specimen received by me from London. It is now supposed that the fibre in question was not sent by Sir J. Bissett, but by Dr. Sutherland, and was obtained from the 'native hemp' plant. It is valued at £50 per ton, if sent home in good condition, and is said to be the best fibre in the exhibition. It is now, of course, quite certain that this was really the case. It is somewhat singular that botanically, there would seem to be no difference between this plant and the common hemp of commerce, but the fibre of the Natal variety appears to be much finer and more valuable. Dr. Sutherland has grown some quantity of it, and can most likely give valuable information about its cultivation and yield per acre, but the price above quoted can, I fear, not be relied on. The only objection I have yet heard made is, that after the plant has been cut down the sharp ends of the stems are liable to damage the feet of the oxen, a difficulty which could, I should say, very easily be surmounted. Of course this plant is an annual, requires a fairly rich soil, and yields a crop each season."

UM-BOGOZEMBE.—Again referring to my report for 1886, I find the following:—"I received from Messrs. Christy and Co. a small sample of fibre, said to have been sent to the exhibition from South Africa, but, the labels having been misplaced or lost, it could not be ascertained from whom it came, or whether it was from Natal or not. After some trouble I believe that I have succeeded in identifying it as having been obtained from one of our indigenous plants, a member of the order Urticaceæ, but, as I have never seen flowers of the plant, I cannot do more than guess at the genus." This was said to have been the second best fibre in the exhibition. I subsequently obtained from Inanda male and female flowers of this plant, which proved to be a new species of *Urera*, a genus belonging to the same order, and to the same division of the order, as the *Rheea*. It was figured in the "Icones Plantarum," in 1888, where it is said:—"The yarn prepared from this fibre was of a greyish colour, bleaching easily under the ordinary treatment to a full white. It was remarkably soft to the touch, more nearly resembling an Angola yarn than flax or cotton. This fibre has been submitted to flax-spinners of experience, and from inspection, together with the results of laboratory investigation, they have formed a high estimate of its value."

Of the above-named plants, the last two appear to me to be the most suitable for cultivation in Natal, being both natives of the colony, and therefore more likely to succeed than an imported and tropical plant such as the *Rhea*. The *Urera* grows readily and quickly from cuttings, which may be obtained in quantity from near the coast to as high as 2,000 to 3,000 feet above the sea. It is well known to the natives, and a specimen may be seen in the gardens. As to the yield per acre and value of the product, I have no information at present. In a letter to me from Mr. T. Christy, of London, dated 9th December, 1886, he says of this plant:—"This is the next most wonderful discovery of fibre for paper, perhaps showing 80 per cent. yield, enormous, and you will see how splendidly it looks, although straight from the machine. Match this raw material, and we will test samples for you. We have sent out to our correspondents the bast to be matched, for we can take any quantity, as it will cut out Esparto in every way."

The next two plants are Monocotyledons, and the fibre is obtained from the leaves, not from the stems as in the plants previously alluded to.

MAURITIUS HEMP (*Furcraea gigantea*).—This is the plant which in Natal is usually called an aloe, but it really belongs to a different order. Large quantities of its fibre are exported from Mauritius and other places, and it has been grown in Natal, but, chiefly in consequence of the inferiority of the machines used, I am afraid that it has not so far been found very profitable. The plant, however, succeeds quite well in the coast districts, and if profitable in Mauritius should be worth attention here. It is stated that to produce a ton of dry fibre ready for shipment 80 to 150,000 leaves are required, varying according to the size and age of the leaves and character of the season. [Note.—This is evidently a printer's error, and should be, I think, 80,000 to 150,000 lb. of leaves, and this error was unfortunately copied into the *Farmers' Magazine* for July, 1895.] Another statement is—"The account of fibre obtained from leaves of the Aloes Vert (*Furcraea gigantea*) was at the rate of 3 per cent. of the green leaves, the yield per acre being about $1\frac{1}{2}$ tons."

SISAL HEMP (*Agave rigida*, var. *sisalana*).—This is the plant which has been so extensively grown in the Bahamas and other places, and is said to be the best of all the fibre-yielding agaves. One of the great advantages which this plant possesses over other allied plants is that it has no teeth or spines on the edges of the leaves to obstruct the gathering or entangle the fibre. It is propagated in two ways—from the bulbils or seeds, which are only produced when the plant arrives at maturity; or by suckers, which are thrown off by the plant in its earlier stages. These suckers reach a length of 1, 2, or more feet; not only from the terminal bud, but also from every two or three joints, a plant can be obtained, and the removal of these suckers is actually advantageous to the plant. When put out in the field, they should be about 15 inches high, and the usual method is to allow from 600 to 1,000 plants to the acre, but care should be taken to leave a wider space between every fourth or fifth row to admit the passage of vehicles for removing the leaves. "As the weight of the green leaves is so large in proportion to the weight of fibre, their conveyance from distant parts of the plantation to the factory must involve considerable labour and expense. For instance, if every 100 tons of green leaves will yield only about $2\frac{1}{2}$ to $3\frac{1}{2}$ tons of dry fibre, it is evident that an immense quantity of useless pulp has to be conveyed to the factory, and disposed of as conveniently as the circumstances will admit. Fibre estates should, therefore, be established on moderately level ground, where light portable railways could be laid, or on moderately sloping ground, where wire ropes could be used for sliding the leaves in portable bundles to the factory." If the plants are, say, 12 to 18 inches high when put out, cutting may commence in four years, as they should then have leaves from 2 to 3 feet long, and catch crops between the rows may be obtained with advantage, provided that they are not too thickly planted; but sweet potatoes should not be planted between the rows—at any rate, until the plants are 2 feet or more high. The plant does not require rich soil, and most of our worn-out cane lands would, in my opinion, suit it well. The yield of dry fibre per acre may safely be estimated at half a ton per annum, but in favourable situations would probably exceed this estimate. In the Bahamas it is said by Sir Ambrose Shea, in his report, that the estimated yield from a plant is 2 lb. per acre per annum, and that 1,000 plants per acre are now being planted instead of 600 as formerly, which, assuming that results are not modified by want of room between the plants, will increase the yield to 2,000 lb. per acre. The value of the fibre has been stated at from £25 to £40 per ton; it has been as low as £18, and in 1891 was £56. It is subject to much fluctuation according to the state of the market or the excellence of the sample. As to the duration of the plant, there is some little discrepancy in the statements—one writer putting it down as a century or more, while others limit its bearing life to ten or twelve years. Of course poling must be prevented—that is, the flowering stem must be cut down as soon as it appears, or the plant will quickly die; and root-suckers should be periodically removed, as they tend to weaken the plant. As the plants do not pole (or flower) simultaneously, a

stock of young plants can be kept on hand to fill the place of those that die, and perhaps this is what the writer had in view who estimated the life of a plantation at a century or more. By the kindness of the director of Kew Gardens, we received in 1891 a box by parcels post, containing about twenty small plants, which were at once put out, but in consequence of the length of time they had been in the box they were somewhat damaged, and took some little time to recover, but they are now good-sized plants, and leaves fit for cutting might have been taken from them some months ago.

We have in the gardens two plants of *Furcræa Lindeni*, which were planted in 1884, the leaves of which are now 8 feet long, and weigh about 10 lb. each. These plants have each about 140 to 150 leaves fit for cutting, in addition to numerous withered leaves at the base of the stem. Neither of these plants have shown any sign of poling, but one of them has produced suckers from its axils at the base, which are now in flower, and will probably produce bulbils.

The disadvantage of this plant is that the edges are furnished with spines which would render them troublesome to handle and work. Mr. Baker, in his "Handbook of Amaryllideæ," states that this plant is a variety of *F. cubensis* with variegated leaves. *F. cubensis* was, and perhaps still is, cultivated for its fibre in Mauritius, and in the *Kew Bulletin* for 1887 I find the following note about it:—"Silk grass (*Furcræa cubensis*), leaves 5 to 6 feet long, generally armed with strong prickles, but sometimes unarmed or with few prickles. Common in Jamaica, and might be largely propagated at once. Value of fibre—(a) £21 good quality, but might be whiter; (b) fairly clean, fair colour, value about £28 per ton; (c) superior to sisal, and worth £27 per ton. A good fibre, not quite sufficiently white in the centre." These refer, of course, to different samples of the same fibre.

A sample of fibre from two leaves of *Furcræa cubensis* may be seen at the gardens.

THE COCOANUT (*COCOS NUCIFERA*).

By E. COWLEY,

Manager, Kamerunga State Nursery, Cairns.

THIS most useful of all the palms seems to have obtained a slight natural introduction on our Northern coast and on the islands adjacent, it being found indigenous at some points north of Cardwell. No extensive groves are, however, met with. This palm does not abound on any of the better known islands of Torres Straits. One island is called "Cocoanut Island"; there are, however, probably not more than twenty cocoanut palms growing on it. For some unknown cause Nature's distribution of *Cocos nucifera* has not extended to Australia. Where the original nut was first grown seems to have been a source of conjecture from times immemorial. Nicholson gives the date of its collection from the East Indies as 1690. An old encyclopedia says it is a native of Africa, the East and West Indies, and South America. Travellers in the South Sea Islands know it to be a native of those localities. The atolls of the Indian Ocean have these as almost their only vegetable production, so that the range is great. When we consider, however, that Nature has so constructed the nut that it will float for a long time in water, and that salt water is not inimical to its life preservation, the wonder is that our shores have not long ago been strewn with living cocoanuts.* It has been remarked, and is probably true, that the aboriginal natives

* In 1870, there were two cocoanut-trees growing on Rattlesnake Island, Cleveland Bay. They were cut down by persons unknown. Cocoanuts also were then growing on the Percy or Franklin Islands, between Townsville and Cooktown.—Ed. Q.A.J.

of Queensland are so fond of the nuts that when a stray one effects a landing it is seized at once and devoured. This theory, however, hardly seems the correct one, for, as has been hinted, the outlying islands of Torres Straits are almost bare in this particular, and the Australian aboriginal rarely ventures so far away from the mainland—his ships are not built for long voyages. Whatever may be the cause—it is a fact—Australia is not the present home of the cocoanut. The object of this article is to endeavour to strengthen the public feeling in its favour. It has been known, not only from the isolated specimens growing at intervals on our coast, but from actual trials by planting, that the cocoanut will thrive and produce fair quantities of fruit from, we will say, Mackay northwards. It is, perhaps, needless to remark on the extent of the available coast, a considerable portion of which is suitable for the growth of this nut. There are some 1,200 miles of coast well within the tropics, to say nothing of innumerable islands. Portions of this have been disposed of by former Governments to form the sites of towns, or they are otherwise unsuitable, but there is a vast territory which may be said to be awaiting the cocoanut planter's attention. The work of Captain Griffiths at Mackay is certainly deserving of support. It has been stated, and perhaps there is a ground of truth in the remark, that cocoanut planting should have been started at some more tropically centered point than the 21st degree of latitude, so that the effect of the work would have been more speedy and certain. Cooktown would be, perhaps, a more favourable headquarters for the cocoanut planting station. Work could there be prosecuted both to the north and the south; the conditions obtaining in the belt of latitude between 15° and 16° S. is all that could be desired. The port is a frequent calling-place for New Guinea and South Sea Island ships, and is right in the track of the mail boats connecting with Java, Ceylon, &c. The steamers of the mail line could be easily (it is presumed) engaged to carry quantities from either of the ports mentioned, and it is possible that a change of seed, as from the Indian Ocean, would be fruitful of advantage in several ways. The planting of cocoanuts in groups on the various islands might be arranged in such a manner as to indicate their names, so that the system would be of service to navigators in more ways than as a means for food. The habitat proper to the cocoanut is within the tropics. It has been noted on the windward side of some of the South Sea Islands, where occasionally the roots of the tree were actually washed with salt water. It probably has not been determined whether the lee or windward side of an island is more favourable to the growth and fruiting of the cocoanut palm. Along the coast of Queensland the south-east trade winds may roughly be said to be prevalent. It is to be presumed, however, that some localities will be found to be more suitable than others, at intervals along its length. Simmonds tells us that—"Soils suitable for a cocoanut plantation are variously described as below, particularly observing that stony grounds or those overlying rocky foundations are to be avoided:—First, soils mixed with sand, either dark-coloured or river washed. Second, where sand is mixed with clay, ferruginous earth, or black mould. Third, clayey soils where the under strata consist of sand. Fourth, sand and clay, even when mixed with gravel and pebbles. Fifth, the seashore, banks of breakwaters, rivers, tanks, and paddy-fields. Sixth, alluvium of rivers and breakwaters, provided a yard and a-half of land is to be generally seen above water level. Seventh, marshy land, even in brackish soils (but not where salt is formed in crystals by evaporation). Eighth, all level lands exposed to the sea breeze, where the soil is good, as in the valleys between hills, and at tanks and ditches which have been filled up. Ninth, even the floors of ruined houses, well worked up, and any place much frequented by cattle and human beings, on account of the ashes and salts of ammonia from the urine, &c., deposited day by day in the soil."

The accumulated breccia from coral reefs, thrown behind the protecting sandhills on beaches, mixed as it generally is with a slight proportion of sandy soil, forms an excellent compost for the cocoanut. It is often found that

lagoons are formed in such places; the banks of these stagnant pools make good sites for the growth of the tree. Our coast has never been surveyed from this point of view, and consequently it is only in the immediate neighbourhood of settlement, where actual values of this class of Government land could be estimated. There is one well-known stretch which forms the background of the Port Douglas beach, and extends for miles from that town in the direction of the Mowbray. Perhaps no more favourable-looking block of land (at present looked upon as valueless) could be found on this continent for an experimental cocoanut plantation. In all probability this class of land continues to Double Island, where Mr. Jameson formed, some years ago, what is probably the largest private cocoanut plantation in Queensland. That the tree thrives admirably at and in the neighbourhood of Cairns is evinced by the specimens growing on the beach in that township. It will probably be found that some of the numerous varieties of the cocoanut will thrive better than others on our beaches, and also that some will grow and bear fruit in one locality better than the same kind will in another, even in Queensland. It is probable that no systematic grading or separating one kind from another has been attempted by private growers. It is to be hoped and recommended that this will be done whenever practicable, as the planting should form object lessons to those who hereafter may be desirous of forming private plantations of cocoanuts. Simmonds gives the name and description of thirty varieties, and doubtless New Guinea and the various groups of South Sea Islands would total as many more. With this range of variety it would be unwise to condemn cocoanut planting without at least trying more than one kind. There is a delightful little dwarf variety growing on at least one island off the coast of British New Guinea. One of these was noted with fruit, about 2 feet from the ground, in the garden of Mr. Lawes, of Port Moresby, but its correct habitat was not obtainable.

Perhaps the kind known in Fiji by the name of Rua'ndrau (Rua-indran?), or two hundred (signifying that 200 nuts are produced annually by that form), is one to which attention might be directed. This tree has a dwarfish look, and had some of the appearance possessed by the trees growing in front of a well-known residence on the esplanade, Cairns. Fruit of the form Rua'ndrau might perhaps be obtainable by communication with the Fiji authorities.

There is something, of course, to be taken into consideration, economically, regarding the kind which will not only produce the greatest number of nuts, but which is also the best yielder of fibre and copra. The largest-sized nut externally has not always the greatest amount of kernel, but may probably be a good fibre-yielder. To grow cocoanuts for economic purposes, a number of facts must be ascertained before starting a plantation, just as in other agricultural ventures. The one great factor that must be considered in this, as in other tropical agricultural pursuits, is that of labour. Machinery of modern type has, of course, been introduced to deal with the cocoanut, and it is highly probable that as yet the fibrous covering has not been dealt with so that the most economical results have been obtained. The extraction of the kernel, known in commerce as copra, has also to receive attention from the mechanical inventor or expert. The difficulty here is the hard shell and the extraction of the kernel. The old-fashioned method of breaking the shell and scraping out the contents with a curved sharp knife will have to be improved upon. Once the kernel is removed, the after manipulation is simplicity itself.

Cocoanut planting is perhaps hardly an undertaking for a man who could not command some amount of capital, nor is it perhaps to be recommended as the sole means of livelihood in any case, but to those who can command suitable land and the necessary capital there are many worse ventures than that of cocoanut planting.

To a Government wishing to increase the value of its waste and suitable lands, and combine beauty with economics, nothing better could be recommended. The prosecution of forestry in all its branches has always

marked intelligent legislation. Few countries are blessed with advantages such as Queensland possesses ; she is perhaps the only one of the Australian group that has the tropical features so necessary in this regard. The time will probably come when the more wealthy Southerners will awaken to this fact, and launch some of their money and energy in clothing the shores of Queensland with the cocoanut palm. This may perhaps be considered by the more prosaic as flavouring of romance and not practical. In this connection it may be as well to quote from the *Produce World* of October. Under the heading "Notes and Views," it has the following:—"Several cocoanut properties have lately changed hands in Ceylon, the prices paid varying. Thus: Letchimey estate, consisting of 248 acres, went for 162,000 rupees, being equal to 660 rupees per acre. The Setavana plantation of 100 acres realised 33,000 rupees, or 330 rupees per acre, just one-half. Brankajaya failed to find a sale at auction, and has since been sold for 40,000 rupees, which, as the average (*sic*) was 200, comes out at 200 rupees per acre. Last, the unpronounceable Aspokunawattee property went for 48,000 rupees—it consists of 365 acres, 200 of which are planted with cocoanuts." There is, perhaps, not much encouragement in this statement to the individual who is looking out for a rapid means of accumulating a large fortune. Such rapid accumulation of wealth is not to be found in any agricultural venture—whether in the tropical, semi-tropical, or temperate zone—in the present age. The abolition of slavery was far-reaching in its effects ; still, to thoughtful men, with a little capital, cocoanut planting on our Northern shores should be considered as a probable factor in the comfort of the individual and in the wealth of the colony.

Bacteriology.

OFFAL-FED SWINE.

THE Year Book of the United States Department of Agriculture says that every slaughter-house is, from the very nature of things, a centre of disease, and, naturally, the poorer the condition of the premises the more dangerous they are. In a majority of cases hogs are kept on the premises to eat the offal. Many of the premises are badly infested with rats, nearly 50 per cent. of which, on being examined, proved trichinous. Even if only a few animals are slaughtered each week, the total number may amount to several hundred during the year. At least one of the hogs has trichinosis; and when the offal of this trichinous hog is fed to the hogs which are raised on the ground, the latter cannot escape infection with trichinæ. But that is not all. The slaughter-houses are, as said, overrun with rats; the rats feed on the offal, and, when feeding on the offal of a trichinous hog, they likewise cannot escape infection with trichinæ. As a matter of fact, the rats captured at slaughter-houses, meat-shops, and rendering establishments were found to be affected in much greater proportion than rats taken from other sources. For instance, of sixty-three rats which were taken from slaughter-houses, 55·55 per cent. were trichinous, whilst none taken in barns or feed-stores or hotels were infected. Rats act as direct transmitters of trichinosis to hogs. If a hog kept at a slaughter-house eats a rat, the chances are fifty-five in 100 that it will become infected with the disease. Now, suppose that one of these establishments is burnt down or abandoned, the rats wander to the neighbouring farms and barns to obtain food; and of every hundred rats which leave the slaughter-house grounds, fifty-five carry with them the disease known as trichinosis. This disease they transmit to farm hogs, if eaten by them, and that hogs do and will eat rats has been proved by experiment. Offal-fed hogs are liable to be infected to an extent varying from 10 to 100 per cent., and this custom of feeding hogs at country slaughter-houses unquestionably is mainly responsible for the spread of trichinosis among the hogs of the two States visited. But trichinosis is not the only disease which the country slaughter-house spreads by offal feeding. It is well known that tuberculosis occurs in cattle and hogs. Feeding the offal of tuberculous animals to hogs will transmit the disease to them, and these hogs when used as food may in turn transmit tuberculosis to human beings. Then the country slaughter-houses are also centres of infection for a number of animal parasites which are injurious to live stock and even to man, and which are spread by means of dogs. The latter, whilst eating the discarded organs, infect themselves with several kinds of parasites, of which the more important are: The *Echinococcus hydatid*, found in the liver, lungs, and other organs of cattle, sheep, hogs, and certain other animals. It varies in size from a small object as large as a hazel-nut to a bladder the size of a child's head. This bladder contains numerous tape-worm heads; and when eaten by a dog, each head produces a small tape worm. The eggs of this tape worm are in turn transmitted to various domesticated animals and to man, and give rise to hydatids. In man it is said to be fatal in five years in about 50 per cent. of the cases. It can, however, be almost completely eradicated if slaughter-houses are properly cared for.

The thin-necked bladder worm, which develops into the marginate tape worm when eaten by dogs, is scattered by them on farms, on roads, &c., and infects thus cattle, sheep, and hogs. The same thing occurs with the very rare gid bladder worm found in the brain of sheep. The tongue worm is found encysted in the viscera of domestic animals, and inhabits the nasal cavities of dogs, producing numerous eggs, which are transmissible to man.

It is needless to enumerate all the diseases which might centre at a slaughter-house; but two more maladies—*i.e.*, hog cholera and swine plague—demand attention.

Many slaughter-houses drain directly into creeks. If hogs suffering from hog cholera or swine plague are killed and the entrails thrown into a yard draining into a creek, it inevitably follows that the creek becomes contaminated, and the disease then spreads to farms lower down the creek, and an outbreak of disease will follow. The same remarks apply to wire worms in sheep. Thus the farmer suffers loss in his stock, against which he can only be protected by a rigid inspection of country slaughter-houses.

In his book on "Pigs and their Management," Mr. W. R. Robinson, of Toowoomba, says: Farm and dairy-fed swine are always worth more than those fed on meat and offal; they are also subject to less disease, and the time is not far off when offal-fed pigs will have to be very carefully inspected before being allowed to go into consumption. Slaughter-yard, meat-works, and general offal-fed pigs certainly put on condition very quickly, but I maintain they are not fit for human food. The manner in which the brutes are fed is simply disgusting. Pigs are naturally clean animals; but if we confine them to dirty yards and compel them to eat all sorts of filthy food, we alter their nature, and at the same time alter the quality of their fat and flesh.—Ed. *Q.A.J.*

Chemistry.

DENITRIFICATION OR NITROGEN-WASTE.

By J. C. BRÜNNICH,
Agricultural Chemist.

THE great importance of the chemical element "nitrogen" as a constituent of certain animal and vegetable substances has been known for a long time, but only in recent years were valuable discoveries with regard to its share in the chemistry of vegetation made. We have hardly learned how the nitrogen of our atmosphere is assimilated by leguminous plants with the help of certain bacteria living in the root nodules of these plants, and learned how even to harness these bacteria into the service of agriculture, by cultivating them in laboratories and applying these pure cultures ("nitragin") to the land, when we are startled with a new discovery that other bacteria, chiefly found in the dung of our barnyard manure, are capable of destroying or denitrifying nitrogenous compounds under liberation of free nitrogen, and thereby causing an enormous waste of this valuable element. Experiments are now being carried on by the celebrated agricultural chemists—Wagner, of Darmstadt; and Maercker, of Halle. The investigations are not as yet completed, but a few of the really startling results already obtained have been made known, and are discussed in an article in the *Journal* of the Royal Agricultural Society of England (No. 31, vol. 8, part 3).

Before going into the details of these experiments, and in order to understand their full value, it will interest some of our readers to get some ideas about nitrogen and its compounds in general, its sources, and the manner in which it finds its way to the plants.

The gas nitrogen, in its uncombined state, forms nearly four-fifths of the volume of our atmosphere. The atmosphere contains also small amounts of nitrogen in combination in the form of ammonia, nitrous and nitric acids. In nature, nitrogen is also found in the form of saltpetre, as nitrate of potash and nitrate of soda.

In plants nitrogen is always present, though only in small quantities (about 1 per cent. in a crop of wheat and about 2 per cent. in a crop of clover); still it forms part of the most essential constituents, and is generally found in larger quantities in the seeds. Nitrogen, with a little sulphur and with the, in organic compounds ever-present elements—carbon, oxygen, and hydrogen, forms the albuminoids often called flesh-formers. To these albuminoids belong the fibrin found in the gluten of flour, the legumin or vegetable casein found in the seeds of beans, peas, &c., and the vegetable albumen found in the juice of most plants. All these compounds are closely related to the well-known albumen, or white of egg. Other nitrogen compounds found in plants are the nitrates, amides, and alkaloids (as quinine, theine, strychnine, &c.).

Nitrogen is also an important constituent of the animal body; the body of an ox contains, for instance, about 3 per cent. of nitrogen. The nitrogenous substances of the animal body are—Proteids (for instance, albumen or white of egg, which is coagulated by heat and is dissolved by the pepsin contained in the gastric juice of the stomach and converted into peptone); albuminoids (for instance, casein, the chief constituent of the curd of milk, and gelatine, a constituent of bones, skin, and sinews); and horny matter, as keratin, found in horns, nails, feathers, wool. In the brain and other nervous substances the chief constituent, lecithin, contains nitrogen as well as phosphorus.

From the great analogy between the nitrogenous substances in plant and animal life, it will be seen that to a great extent the value of a plant or its seeds as a food for animals depends on the amount of nitrogen contained therein. From the vegetable albuminoids found in the seeds of the cereals wheat, oats, rye, &c.; in leguminous plants and their seeds, as beans, peas, clover, lucerne, cow peas, &c.; in the roots and tubers of turnips, mangels, potatoes, &c.—are formed by the process of digestion after these foods have been consumed by the animals, the albuminoids found in milk, flesh, blood, &c. Even horn, hair, and fat are formed from these albuminoids. Albuminoids thus supply nearly everything required by the animal body, not only the flesh and blood, &c., but also force and heat. The amides and other nitrogenous compounds found in plants, and forming part of the food, are simply burnt in the animal body, and give, like fat, only heat and force. The nitrogen introduced into the animal body is not all used up for the building-up of this body, but a part of it is removed with other products of oxidation of waste material and old tissue in the form of urea; this nitrogen compound contains about half its weight of nitrogen.

The nitrogen compounds found in plants play also an important part in the germination of their seeds, and form part of the nourishment of the young plants.

No crop will flourish without a sufficient supply of nitrogen, and this supply of nitrogen may be obtained from the following sources:—

1. Atmospheric nitrogen.
2. Nitrates, nitrites, and ammonia found in the atmosphere, and washed down and carried into the soil by rain.
3. Nitrites and nitrates formed in the soil by the process of nitrification of organic nitrogen compounds always found in vegetable residue and humus of the soil. These nitrogen compounds contain the nitrogen in an inert form, in which it cannot be made use of by the plants. Certain microbes, however, decompose these organic nitrogen compounds, and transform them first into nitrites and eventually into nitrates. The activity of these nitrifying bacteria is increased by moisture, warmth, and looseness of the soil. Too much moisture, however, is detrimental; and in wet, badly-drained soil, for the want of access of air, nitrification will not take place.
4. Nitrogenous manures, as farmyard manure, oilcake, and artificial manures, containing nitrogen as sulphate of ammonia and nitrate of soda.

ASSIMILATION OF ATMOSPHERIC NITROGEN.

Until the year 1886, all scientists, with the exception of G. Ville, declared that free nitrogen gas was not used as a food by plants. Hellriegel discovered in that year that certain leguminous plants could assimilate free nitrogen, with the help of micro-organisms or bacteria living in the nodules found on their roots. The leguminous plants differ in this respect from the large order of Gramineæ, to which all our cereals and grasses belong, and which depend for their nitrogen supply exclusively on the nitrogen compounds contained in the soil. Crops of Leguminosæ—as lucerne, clovers, lupines, cow peas—are not only quite independent of the nitrogen compounds present in the soil, but are capable of accumulating nitrogen, and thus enriching the soil, thereby improving it for a crop of cereals following the leguminous crop.

Hellriegel's experiments were continued by others. Professor Nobbe made cultivations of these bacteria living on the nodules of various Leguminosæ. Although the bacteria obtained from various plants cannot be distinguished from each other, their action shows a great difference, and special cultivations brought into the market under the name "nitragin" are recommended for each crop. This nitragin is contained in little bottles, about half-filled with a little brown jelly, on which a white mould is noticeable. Each bottle is sufficient for about half-an-acre. The contents are dissolved in lukewarm water, and the seeds to be sown sprinkled with this water; or about 56 lb. of soil are moistened with the liquid, and the soil spread over the field to be sown and worked in to a depth of about 3 inches.

NITRIFICATION OF INERT NITROGENOUS SUBSTANCES.

This process has been known for a considerable time, and until comparatively recent times this process was made use of in the artificial preparation of saltpetre on the so-called nitre beds. These beds were formed out of certain earthy matters—loam, marls, ashes—mixed with dung; they were kept moist with urine, and turned over frequently. Periodically they were washed out with water to obtain the nitrates formed. The heaps had to be kept loose to promote free circulation of air, as a plentiful supply of oxygen is necessary for this process of oxidation. A similar process takes place in the soil, and is due to the activity of micro-organisms.

DENITRIFICATION OF NITROGENOUS SUBSTANCES.

The discovery made by Wagner and Maercker, which at present startles all agriculturists, is the fact that dung contains bacteria which are able to destroy nitrogenous substances under liberation of free nitrogen, which, of course, escapes to the air.

Dung contains nitrogen in the various forms already mentioned; the chief part, however, about 80 to 90 per cent., is in the inert albuminoid form very slowly, if at all, assimilated by plants. The remainder of the nitrogen is in the form of ammonia, nitric acid, and the easily decomposed amides, which are all available to plants at once. The nitrogen contained in liquid farmyard manure, chiefly urine, is principally in the form of urea, which is also readily decomposed and easily available.

Maercker showed this great difference in the assimilability of the nitrogen by experimenting with plants grown in pots filled with soil which contained an abundance of phosphoric acid and potash. Oats grown in this soil without nitrogen being added yielded 44·82 grammes of grain and straw. Another pot, with an addition of 1·5 grammes of nitrogen in the form of nitrate of soda, produced 128·37 grammes, corresponding to an increase of 186 per cent. By supplying 2·25 grammes of nitrogen to soil in the form of two different samples of horse-dung, one of cow-dung, and one of ox-dung, the respective yield of grain and straw was 35·91, 23·33, 41·65, 46·80 grammes. In the first three cases, the yield was reduced—in one instance as much as 48 per cent. The ox-dung produced an increase of only 4 per cent. Experiments with white mustard gave similar results.

Wagner experimented also with white mustard, and, like Maercker, repeated each experiment three times, and all the results agreed very closely. The yield of mustard was 1·6 grammes in soil without nitrogen, and 35·6 grammes in soil supplied with 2 grammes of nitrogen in the form of nitrate of soda. When supplying the same amount of nitrogen to the soils in the form of cow-dung and horse-dung, the yield was only ·5 and ·4 grammes respectively, corresponding to the heavy drop in the yield of 69 and 75 per cent. Analyses of the plant showed that the crops had appropriated absolutely no nitrogen from the dung, and the plants contained even less nitrogen than the plants grown without any added nitrogen, thus showing that even the ammoniacal and amide nitrogen, which is always present in small quantities in the dung, was not used up by the plants, but was made inoperative.

Further experiments made by Maercker showed that ·75 gramme of nitrogen, added in the form of nitrate of soda or urea, more than doubled the yield when applied to soils containing no dung; the yield, however, was very much reduced if applied to soils containing also dung. The larger the amount of dung contained in the soils, the greater the loss of nitrogen.

Wagner found that by using nitrate of soda in soils containing no horse-dung as much as 60 per cent. of the nitrogen applied was recovered in the increased crop of mustard, whereas with a light dressing of horse-dung only 30 per cent. of the nitrogen applied was recovered. Horse-dung similarly affected the nitrogen added in the form of urea and chopped lucerne. In other extensive pot experiments with oats, various nitrogenous manures were applied,

as nitrate of soda, sulphate of ammonia, blood meal, chopped grass, cow-urine, horse-dung, cow-dung, various farm-yard manures; the results obtained were again similar, and all proved that dung possesses the peculiar action of not only preventing the organic nitrogen contained, for instance, in green manure, from becoming nitrified, and made available, but even to make the nitrogen already in a directly available form, as, for instance, nitrate of soda or sulphate of ammonia, partially useless.

Wagner experimented also in pots containing soil without plants, and found that this actual loss of nitrogen was not due to its sinking lower into the soil or subsoil, but that the nitrogen really disappeared entirely from the pots. In all cases he proved that an addition of dung to soils containing nitrate of soda caused a partial disappearance of nitrogen, which loss was increased by applying heavy dressings of dung.

Numerous experiments made by Wagner, Maercker, Stutzer, Pfeiffer, Dietzel, and others proved that nitrogen was dissipated in its free form, and escaped into the air, and that this action is caused by the presence of certain bacteria found in dung. Dung sterilised with bisulphide of carbon only showed a slight start of denitrification after the lapse of four days, by which time all the nitrogen in soils containing unsterilised dung was destroyed.

Maercker also made experiments substituting wheat straw for dung; and Wagner used rye straw, adding these finely chopped up to soils; and they found that both these substances, by their action on nitrate of soda, showed that they contain denitrifying organisms, or else produce very favourable conditions for the development of these bacteria.

The next step of investigation was to find out how this denitrifying action of dung or farmyard manure, which acts quite similarly to dung alone, could be prevented. Both investigators showed that age and frequent turning of the heaps somewhat diminished the power of denitrification. Fresh dung in all cases acted much more vigorously than old dung; well-rotted farmyard manure possessed very little denitrifying power.

These remarkable results obtained so far explain the failure of a large number of manuring field experiments made in England and elsewhere. It has frequently been found that addition of artificial manure to farmyard manure not only failed to produce an increase of the crop but very often resulted in a depression of the yield. Different explanations in such cases were given, but the experiments of Wagner and Maercker leave no doubt of the actual cause, and will prevent further waste of valuable nitrogenous manures by adding them to dung or farmyard manure.

Further experiments also showed that an addition of superphosphates and of kainit to dung increases the denitrifying action considerably, and also counteracts the action of age and of the turning of the manure heaps.

W. Somerville, in his article on the experiments of denitrification mentioned above, shows that these last experiments seem to explain the failure of manuring experiments in Northumberland, where in 1893, when applying 12 tons of dung per acre, the average yield of crops of swedes of nine farms was 2 cwt. per acre heavier, with $2\frac{1}{2}$ cwt. of superphosphate, than when they applied 5 cwt. of superphosphate to the same quantity of dung.

In similar cases in nine farms in Cumberland, Durham, Northumberland, in 1895, where superphosphate or dissolved bones were used in conjunction with dressings of farmyard manure, the farms supplied with the largest quantities of phosphates gave the lightest crops. This increase of the denitrifying action might be attributed to a better development of the denitrifying bacteria in presence of an abundance of food containing phosphates and potash.

The results so far obtained are of the greatest importance, and all agriculturists will await the publication of further experiments with the greatest interest. The experiments will no doubt be repeated by other investigators, and it will also be interesting to find out how our climate in Queensland will act on the denitrifying bacteria found in farmyard manure.

INFLUENCE OF THE MOON ON WEATHER AND CROPS.

A CORRESPONDENT asks us if the moon has any influence on the weather in connection with agricultural operations. The days have long since gone by when the planets Jupiter and Saturn were supposed to influence our destinies, but the faith of mankind in general in the influence of the moon on the weather has never been shaken, and even now, when knowledge is so widely diffused, and physical science brought, as it were, to the doors of all who have the slightest pretension to education, this belief is almost universal.

Virgil, in his *Bucolics*, says: *Jupiter descendet plurimus laeto in bri*—which, being interpreted, means: Jupiter shall descend most abundant in a joyful shower.

And again: If you will work the ground for a crop of wheat and stout corn, and will be eager for ears of corn alone, let the Eastern Atlantides be hidden beneath the horizon before you trust the seeds to the furrows (*Georgics* I.).

If the moon act upon our atmosphere as she acts on the waters of the ocean, she will produce atmospheric tides. But without going deeply into the subject we may state that from thousands of observations carried out by Arago, Laplace, and others, the effect of the lunar attraction on atmospheric tides is within $\frac{1}{600}$ inch—a quantity such as could produce no conceivable effect on the weather. The opinion that the changes of the moon are attended with changes of the weather, is unsupported by facts. Dr. Horsley, so far back as 1774-5, published two papers in the “*Philosophical Transactions*,” with a view to dispel the popular prejudice on the subject of lunar influences. In the first year he found there were only two changes of weather corresponding with the, new moon, and none with the full moon; and in the second year, only four changes corresponded with the new moon, and only three with full moon. Neither theory nor experience leads to the conclusion that the effects which the attraction, or the light, or the presence, or any other physical influence of the moon may be supposed to produce on the weather or on the sowing, growing, or gathering of crops, are in accordance with observed phenomena.

Of course it is not impossible that future scientists may discover some connection between the moon and the vegetation of the earth, for the wisdom of to-day is the ignorance of to-morrow. The celebrated astronomer, Arago, who in 1832 published a most valuable report on the subject of comets, said:—“Whatever may be the progress of the sciences, never will observers, who are trustworthy and careful of their reputation, venture to foretell the state of the weather.” Sixty-five years later we find the weather accurately forecast for a certain time ahead by the Queensland Government Meteorologist, Mr. Clement L. Wragge.

In matters of science, therefore, the word “impossible” can never be accepted. At present we are told by eminent scientists that the moon has no effect on weather or crops. We may find this fallacious some day, but meanwhile we present our correspondent with the opinion of the scientists of the day.



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1.—YOUNG BARRAMUNDI.

2.—FULL-GROWN BARRAMUNDI.

3.—GIANT PERCH.

Pisciculture.

By D. O'CONNOR.

IN my notes on Pisciculture, which appeared in Part 4 of the *Queensland Agricultural Journal*, I stated—"There are other excellent fishes deserving of attention." The chief of these is, undoubtedly, *Lates calcarifer*, known at Calcutta, where it is highly-esteemed, as the Cockup; in the Pioneer, at Mackay, as the Palmer; in various other Queensland rivers as Barramundi; and in the Fitzroy as Barramundi or Giant Perch, this last name being conferred by Mr. De Vis.* It was, I believe, first known in Queensland as the Palmer. It would be sensible and convenient were it to be known in future by this name only; a good deal of confusion would thus be avoided.

The Palmer may be justly regarded as the king of Australian fresh-water fishes; as a food fish or for sport, it is unrivalled. Our figure, taken from a specimen in the Museum, came from Rockhampton. It measures 4 feet 3 inches in length, 2 feet 8 inches in girth, and weighed over 50 lb. An experienced angler from Mackay informed me that for gameness he considered it equal to a Scotch salmon for the first half-hour after it was hooked. Of no other Australian fish can this be said. As a table fish, those who are qualified from experience to offer an opinion prefer it to the Murray cod. No attempt, that I am aware of, has ever been made to transfer this noble fish to any new habitat. We have running through Brisbane one of the finest rivers in Australia. Most of it is destitute of fish, excepting mullet, bony bream, and cat-fish; our laws prohibit the netting of the first, and the others are commonly regarded as worthless. Were the Palmer established in the Brisbane, a high-class fish on our tables need no longer be a curiosity. Palmer-fishing in the Brisbane would attract anglers from all directions, and those who go hence to Tasmania and New Zealand for fishing might do better by stopping at home. The distance from Brisbane to Rockhampton is not very great; we have frequent steam communication, and as an alternative route a railway nearly the whole way. The acclimatisation of the Palmer in the Brisbane River should not be regarded as impossible.

**Ostioglossum Leichhardti*, of the Upper Dawson, is the true Barramundi.

Forestry.

FOREST CONSERVANCY.

By A. J. BOYD,
Queensland Agricultural Department.

PART 2.

IN a colony where the majority of the buildings, except in the large cities, consists of timber, and where mining, railway construction, and agriculture are largely carried on, the consumption of hardwood, pine, beech, and cedar is necessarily very great. Hence the demand on the saw-mills is also very large, and proprietors of the latter must keep pace with the former, or they must accept the alternative and close their establishments.

Now, how are the mills supplied? There are three methods by which this end is achieved:—

First, by contracts entered into between the mill-owners and recognised licensed lumberers, or, as we call them here, timber-getters (in which class I include railway sleeper-getters and those who supply cordwood to the sugar-mills).

Secondly, by the purchase of odd lots and occasional rafts brought in by outsiders.

Thirdly, by the mill-owners taking up large selections in well-timbered country, and thus supplying their own necessities to a large extent.

For a long series of years, there was no restriction on the timber-getters as to the size of the timber they were allowed to cut. Neither was there any restriction as to locality. The consequence of this liberty was that timber-getters settled down permanently in a large scrub, and took out every available stick which they could persuade the mill-owner to take. When the large trees were all cleared out, they were content with smaller ones, until finally (I speak from experience) pine-trees of 8 and 10 inches in diameter were cut and rafted into the mills. Quantities of pine were used for shingles, and anyone acquainted with shingle-splitting will at once comprehend the enormous waste which resulted from this mode of working up trees. Considerable lengths of useful timber were left behind owing to the presence of a few knots, which could advantageously have been used in the mill, and besides this the "hearts," backs," and "run-out" shingles were left in the waste heap, any blocks with a "wind" being also rejected. These losses did not cost the splitter a thought, for the simple reason that the actual cost of the timber to himself was represented by the merest fraction of the cost of his license. Now, as it would cost him more to work up an unsound tree, from which he would not get the same amount of profit as he would from a sound one, it followed that an unsound or unfit tree, after being felled, was abandoned to the elements, and thus became another item to the debit of the country.

The outside lots purchased by the saw-mills are, however, often so much gain to the country, as they generally consist of timber which the farmer has saved from the general conflagration, and brought in for sale to recoup him in part for the clearing of his land.

With regard to the third source of supply, the selecting of timber lands by the mill proprietors, as this involves the question of reproduction as well as of denudation, it will be considered at length further on. In the meantime, having seen the causes which have been operating for a long series of years to denude the colony of her valuable timbers, let us take a glance at the legislation of the past as it affected the timber industry.



YOUNG SILKY OAK (*GREVILLEA ROBUSTA*).

In the continental countries of Europe and in the United States of America, all the forests and timber reservations are in the hands of the State or (in Germany) often in those of the large "Gutsbesitzer" or landed proprietors. Herein lies their protection. It would be out of place here to describe the elaborate forest laws of the Continent. Suffice it to say that certain portions of the forests are set aside, by recommendation of the numerous superintending officers, to be cut for the periodical requirements of the district. The timber is then either sold by auction, standing or felled, either by single trees or *in globo*, or it is sold wherever a good market can be found. The same occurs in the United Kingdom. The rigour with which all conditions are carried out results in a constant supply of the most valuable timber, and in the fact that a single plantation or forest becomes a rich heirloom in families from generation to generation. How carefully the forests are there managed may be partly gauged by the fact that 1,000,000 acres of trees are annually cut down to supply the European railways with sleepers.

Mulhall gives the value of timber consumed in Europe annually as £190,250,000; in the United States, £77,400,000. In Europe the consumption amounts to 41 cubic feet per inhabitant, and in the United States to 58 cubic feet.

Our Queensland timber has not hitherto enjoyed such strict protection. Extirpation has been going on for a series of years, but until comparatively recent times very little anxiety has been felt as to future supplies.

But action was taken by the Government in 1879, when certain regulations were issued defining the diameter of kauri pine and hoop pine, which it would thenceforth be legal to cut. Those first regulations, then promulgated by the Lands Department, prohibited the cutting down of any pine-tree having a less diameter than 3 feet. It will not be matter of surprise to those who know anything of timber-getting at the present day, that such a regulation should have caused consternation and a general outcry amongst the timber-getters. Leaving kauri pine out of the question, it is well known that not much hoop pine attains a diameter of 3 feet even in the most favoured localities. And when we consider that large quantities of this valuable timber grow in stony and clayey mountain scrubs, with bleak aspects, it may well be imagined that there a diameter of even 2 feet will be seldom exceeded. Trees of 3 feet are few and far between, and often, when they are obtained, they are found to be "pipey,"* or else are at such a distance from a mill or navigable water as to render them of no value to the timber-getter, who would expend more in transporting the log to a market than he would obtain for it on arrival. The late Mr. Turnbull, who, at the time I am speaking of, was a surveyor at Mooloolah, and had ample opportunities of seeing the operations of the timber-getters, assured me that he had seen trees there of hoop pine which had attained a diameter of 3, 4, and even of 6 feet. They were not numerous, but there is the fact that in certain favourable situations the hoop pine will attain very large dimensions. Against this, a Pine Mountain timber-getter informed me that the largest pine-tree in that locality would not measure 2 feet in diameter, whilst taking the average of what had been cut there it would not be found to be over 18 inches.

At the time of my visit to Mr. Turnbull, there were at least 3,000,000 feet of splendid cedar lying cut, ready for hauling, at distances averaging fifteen miles from the coast, and it was estimated that owing to the nature of the country it would be some six years before the whole of it would reach the coast. There were also at the same time thousands of feet of beech lying on Paynter Creek, Mooloolah, awaiting shipment to the mill.

The kauri is a quick-growing tree, and one which attains a diameter of from 6 to 8 feet in favoured localities. The tree, however, appears to be at its best, and most profitable to all concerned in its working, when it has reached

* On a large timber reserve at the mouth of the Maroochie River, Mr. Pettigrew lately measured some pine-trees, and found them to be 18 feet in girth at $5\frac{1}{2}$ feet from the ground. These large trees were straight for 40 feet, but were "pipey."

a diameter of 50 inches. Subsequently the regulations were amended, and cedar-trees may now be cut having a circumference of not less than 7 feet 6 inches at 6 feet from the ground. The minimum diameter at which kauri pine may be cut is fixed at 2 feet, and that of hoop pine at 21 inches 5 feet from the ground.

The kauri pine makes little wood until it has shot up so as to top the rest of the scrub. If the other timber in the scrub be short, so will be the kauri; on the other hand, if the surrounding scrub be high, the kauri will likewise be lofty; and it is in the latter description of scrubs that the best timber is obtained. Now, by the time a kauri sapling is 12 inches in diameter, it has done all its upward growth. From this period the yearly growth is from 5 to 9 inches in circumference. Instances have been known, and can be verified, of an annual growth of $12\frac{1}{2}$ inches in circumference; but, of course, a great deal depends upon the seasons—a warm rainy season being the most favourable. This rate of growth is maintained pretty evenly, until the tree reaches from 40 to 50 inches in diameter, when the growth slackens off, but does not cease. The kauri, at this time, seems to have attained maturity, the timber being more durable, less liable to flaws, and far more profitable for all parties concerned in its working, except the saw-miller.*

The hoop pine increases at the rate of $\frac{3}{4}$ -inch per annum,† and will top the scrub at a diameter of 10 inches, thus following the example of the kauri in seeking the light before increasing in diameter. As to the value of the hoop pine, considered as building material, I have good authority for stating that at 12 inches diameter it is a good sound timber, and will stand any wear that could be expected of pine timber.

The cedar makes three growths, equivalent to an increased diameter of 2 inches every three years.

Now to apply these figures. To cut the kauri pine on its attaining a diameter of less than 3 feet is a most disastrous policy, as the following figures (which can easily be verified by anyone accustomed to timber measurements) will show:—

Taking the length of a tree at 60 feet and considering the circumference as three times the diameter for practical purposes, we find that such a tree at—

Diameter. Inches.	Circumference. Inches.	Side of Square. Inches.	Superficial Feet.
20	60	= 15	will yield ... 1,124
24	72	= 18	„ ... 1,620
36	108	= 27	„ ... 3,644
48	144	= 36	„ ... 6,480
60	180	= 45	„ ... 10,124
66	198	= 49, 50	„ ... 12,124

Thus a tree, which at 2 feet diameter would yield 1,620 superficial feet of timber, would, if allowed to grow five years longer, yield 3,644 feet, or, in other words, it would be worth over double the money; and if allowed to grow for ten years, would yield exactly four times the amount of timber which a diameter of 2 feet would yield. On the first supposition, or say that a tree requires six years to increase from 2 feet in diameter to a diameter of 3 feet, we have a direct gain of 125 per cent., equivalent to 21 per cent. per annum. In a less degree, the above will apply to hoop pine and cedar.

* This is the opinion of Mr. Luya (Mayor of South Brisbane), who has a lengthened experience with the timber trade, and with the kauri pine in particular.

† The trees measured by Mr. Pettigrew increased at the rate of 1 inch per annum.



TRUCKING KAURI LOGS AT COOTHARABA.

I now come to the question as to the quantity of timber, or rather as to the number of 40-foot logs, which a mill, cutting its 100,000 feet (log measurement) weekly, would require annually to keep it in full work. The following table will show this distinctly :—

20 inches diameter	...	...	...	4,194 logs.
24 " "	...	...	...	2,911 "
36 " "	...	...	...	1,303 "
60 " "	...	...	...	631 "
66 " "	...	...	...	597 "

Mr. Pettigrew says: "I have counted up the sizes of 1,022 logs (not trees) cut here (Mooloolah Saw-mills) lately, and they were:—Under 20 inches, 460; 20 inches to 24 inches, 365; 24 inches to 36 inches, 192; above 36 inches, 5." Taking the average diameter of the logs, the two estimates do not materially differ.

Now, taking into consideration the number of saw-mills in the colony as shown on the accompanying table, how long will it be before our scrubs will be denuded of soft timbers, and our forests of hardwoods, at this rate of working?

Our timber lands, extended though they may be, are not inexhaustible. America and Canada have long since discovered that their forests have limits, notwithstanding that a journey may be made from Patagonia in South America to the Arctic Circle in North America, a distance of nearly 9,000 miles, without leaving the forests, and that the Arctic pine forests stretch in an almost continuous belt through these quarters of the world with a breadth of from 1,000 to 1,400 miles, almost wholly composed of Conifers, such as the Siberian Fir (*Abies sibirica*), Larch (*Larix sibirica*), *Pinus umbra*, *Picea obovate*, &c., &c. Should we not then take a lesson in time, and provide for our supplies being unlimited? How is this to be done? The lesson was taught years ago by our largest saw-mill proprietors. The process is actually in operation under the fostering care of the Department of Agriculture at Fraser Island, Wide Bay district, to which I shall allude more fully further on.

The method adopted by Messrs. McGhie Luya and Co. at Noosa, and I believe also by Messrs. W. Pettigrew and Sons, at Mooloolah, was this: The firm cut no trees under 36 inches in diameter, leaving all the smaller ones to grow, as a supply for future cutting.* Thus some of the scrub blocks were culled more than twice. The average diameter of kauri logs cut at Cootharaba (Noosa) was not less than 4 feet, and many were cut reaching to 5 and 6 feet in diameter. All over that size were left standing, as the machinery was not large enough to deal with them. Experience showed that no kauri under 36 inches diameter at a height of 4 feet from the ground should be allowed to be cut, and no hoop pine under 2 feet 6 inches; but other authorities differ on the question of size of hoop pine, and most consider that 18 inches diameter is a fair limit for that description of timber.

* The largest quantity of kauri at Noosa is between King King and Eulama Creeks, and of cedar at Mount Walvi, about eight miles back east by north of Lake Cootharaba.

At this moment there are some thousands of young trees in the Noosa, Mooloolah, and other districts which will, if fostered, be ample for future supplies.



BUNYA PINE (*ARAUCARIA BIDWILLI*, Hook.)

The next question that arises is that of timber reserves. In Queensland there are State forests in the following districts:—

Place.		Area—Acres.		District.
Fraser Island	... ..	108,800	...	Maryborough.
Barron River	... ..	1,450	...	Herberton.
St. Mary	... ..	1,357	...	Maryborough.
Bungorah	... ..	2,300	...	St. George.
Glastonbury	... ..	4,480	...	Gympie.
Woondum	... ..	640	...	"
Noosa	... ..	640	...	"
Kilkivan	... ..	5,600	...	"
Como	... ..	5,766	...	"
Marodian and Kilkivan	... ..	19,200	...	"
Warrah	... ..	7,100	...	Maryborough.
Brooyar	... ..	5,544	...	Gympie.
Total		...	...	162,877

There are, besides these State forests, areas in various parts of the colony classed as timber reserves amounting in the aggregate to 1,508,374 acres. These, however, include areas reserved for other purposes besides forestry.

The reserves might be classified by a competent authority, according to the description, quantity, and quality of timber contained in each. Thus it could be ascertained how much timber they would approximately produce annually. This settled, we could provide (1) against waste by controlling the cutting of timber; (2) against the destruction of immature trees, by marking those which it would be lawful to cut; (3) for replanting or reproduction in some form; (4) by encouraging and assisting the natural growth of the trees; (5) by sowing seeds and transplanting from crowded localities to other spots less favoured.

By closing portions of the reserves against further cuttings at the end of a year, and opening successive blocks, the means exist for a continuous supply of timber.

There yet remains a difficulty, which I do not see any present method of overcoming without great expenditure. I allude to the heads and limbs of large trees from which the log has been removed, which will cumber the ground and choke the growth of young trees, often distorting them unless the *débris* are got rid of in some manner. Near the large centres of population, or near sugar-mills or mines, this waste presents no difficulty, as there are many people who would be willing to remove them from any closed block, because there would be an immediate market for the wood. Many advantages would accrue from this method of restricted licensing—all the older and matured trees would be utilised, and the young growing timber would be protected.

I might enlarge on this subject, but for the present enough has been said, and in my next paper will consider the best means of reproducing our timber in exhausted areas.

With regard to the effect of forest destruction on rainfall mentioned in my first article (*Queensland Agricultural Journal*, Part 6.), Mr. H. C. Russell, Government Astronomer of New South Wales, says:—"The destruction of forests in New South Wales from the time that ringbarking was introduced, and for some fifteen or twenty years after, would seem to have been more rapid than the destruction of any other forest in the world, and during that period the rainfall gradually increased. There is clear proof that the rainfall in this part of the world did not get less as the trees disappeared; and in other countries where the question has been fully investigated, it has been found that the rain comes whether there be trees or not."—*New South Wales Agricultural Gazette*.

General Notes.

A SERVICEABLE FIRE-BEATER.

WHEN at Hartwood, I (Ed. *Australian Field*) saw a very serviceable fire-beater, of which I try to give some idea in a sketch attached. It consists of a piece of thick tanned leather, about 18 in. by 12 in., mounted in a slit in the end of an ordinary broom-handle and well bound over with copper wire.

Generally, when the cry is raised that the grass has been fired, the station hands rush out with branches of trees, which are only serviceable until the leaves are beaten off; or with wet bags, which quickly get dry, catch alight at the ends and spread the fire to the grass at the rear of the beaters.



A Servicable Fire-beater.

These leather beaters last indefinitely, cost about 4s. or 5s. each, and are always ready for use. They are wonderfully effective, and quickly subdue the fiercest fire.

At North Yanko I saw similar fire-beaters, but made of green hide—which I should think would not last as long as tanned leather, but, of course, cost very little. They were mounted on heavier handles, which, while stronger and less liable to break, would be more tiring to work with for any length of time than a light broom-handle. Widgiewa has similar beaters, and something of the kind should be on every station.

HOW TO SLIP GERANIUMS.

WHEN making slips of geraniums and other plants, do not put them in your flower-pots. Use a separate flower-pot, or, better, a small wooden box filled with sand. A slip is not growing. All it hopes to do is to form roots, and thus save its life. Water is all it needs, and nothing is better to hold water than clear sand. Soil contains microbes that start decay in slips. Sand is sterile and safer. Sand allows all excess of water to escape. A soil is apt to act like a sponge, and keep the slips too wet. Slips will form roots, and grow for two or three weeks in clear sand if kept moist. When the bit of green stem is changed from a cutting into a plant, then, and not till then, should it be planted in soil. Slips make roots at different rates; therefore it is best to keep all of one kind together.

POULTRY PRODUCTS IN THE UNITED STATES.

THE following facts may be of some interest to our readers, whether poultry fanciers or not, and of considerable use in stimulating farmers to give more attention to poultry-keeping. In 1890 there were in the United States 258,871,125 chickens, and 26,738,315 of other fowls—such as turkeys, geese, and ducks. The average value of the poultry (cocks, hens, and chickens) was 1s. 3d. each, and of the other fowls 3s. 1d. each. The number of eggs laid by the hens amounted to 9,936,674,992, having an average export value of 7½d. per dozen. If the average increase of the past six years has been equal to the preceding ten years—and there is every reason to think that such has been the case—the number of chickens of all ages in 1896 would be 350,000,000, and other fowls 35,000,000. The production of eggs amounted to 13,200,000,000, of the value of £33,000,000. The value of the dressed poultry was estimated at £25,000,000, or a total production of £58,000,000. (*Note.*—In these calculations we have left out the fractional excess of value in the American dollar over 4s., so that the actual values would be even higher than stated;

but the sums named are near enough for our present purpose, and, perhaps, quite as near as Uncle Sam counted his eggs.) Now, compare the earnings of the poultry with what was realised from other sources of revenue. The total value of all the gold, silver, wool, and sheep produced in 1896 was £44,486,836, whilst that from poultry amounted to £58,000,000. The following table shows the value of the different commodities :—

Earnings of poultry	...	...	...	...	£58,000,000
Value of cotton crop	...	...	...	...	51,832,928
Value of wheat crop	...	...	...	...	47,587,799
Value of swine	...	...	...	...	37,305,949
Value of oat crop...	...	...	...	...	32,731,313
Value of potato crop	...	...	...	...	15,796,980
Value of tobacco crop	...	...	...	...	7,114,845

It is thus easily seen that the poultry far outstrips all other sources of revenue.

To put it another way : By an examination of the Government reports we find that the year's earnings of the poultry would have bought all the milch cows in America, and have had over £5,000,000 to spare ; or, to put it still another way, the earnings of the poultry would have bought up all the gold, silver, wool, and sheep produced last year, with the tobacco crop thrown in, and still had nearly six and a-half million sovereigns left for some other speculation.

Old Chanticleer is fairly entitled to claim for himself and his Biddies the first position in the march-past of the productions of the United States.—*Scottish Farmer.*

In the September issue of the *Journal* we drew attention to the revenue derived in the United States from poultry of various kinds. A visit since paid to a number of farms and small homesteads reveals the lamentable fact that there are comparatively very few poultry reared by the majority of farmers. Yet there is a great deal of money in poultry.

We do not mean that farmers should go in for fancy breeds for show purposes, but for good ordinary cross breeds, good layers, good table fowl like the crossed Leghorns, Plymouth Rocks, Dorkings, and Games ; also should they pay attention to turkeys and geese. Turkeys are quoted in the Brisbane market for this Christmas at 15s. per pair for gobblers. How easy would it be for small country freeholders, lengthsmen on the lines, especially those in or near scrub lands, to raise at a mere fractional cost sufficient eggs and fowls to clothe and even feed the whole family. They are no trouble, and can be looked after by the younger members of the household. Fresh air, fresh water, dry roosts, a few laying boxes, a good run, plenty of grain and insect food—these are all at the command of most country dwellers at a merely nominal cost, and yet people cannot see it. They invariably say, "Poultry-farming does not pay." We do not suggest poultry-farming. Fifty fowls can be kept without elaborate arrangements, where there are thousands of acres of good runs for them, and creeks and lagoons here and there. We used to keep 100 fowls on a 20-acre farm. The hens laid on an average 6 dozen eggs a week. Besides this, we always had a quantity of pullets and cockerels for sale. These fowls cost us absolutely nothing. There was always plenty of waste corn, there was water in abundance, whilst the neighbouring standing scrub supplied a wealth of animal food in the shape of snails, white ants, and various kinds of grubs. Our only trouble was carpet snakes, who used to get into the roosts sometimes and swallow a chicken or two, besides taking eggs.

Now, we commend this article to wheat and maize growers. There must, at this moment, be hundreds of bushels of wheat lying ungathered after the harvest, as we have no gleaners in this country. All this might, instead of being ploughed in, be picked up by the fowls and turned into money. Yet men, with from 100 acres to 400 acres of wheat, run about one ill-bred hen to 10 acres, thus throwing good money away. Say 1,000 farmers run 100 hens each. Suppose these hens to lay three eggs a week each on an average, or

say 150 eggs a year, the result would be 15,000,000 eggs from 100,000 hens, or 1,250,000 dozens. At 4d. per dozen, the return would amount to £20,833, or nearly £21 per annum per owner. Besides this, there would be always plenty of table-fowl for home use, and cockerels and pullets for sale. As for the aged fowls, when no longer profitable, they would naturally, as an American paper puts it, "find their way to the hencoops of the steamship companies, to railway refreshment-rooms, where they are put to very profitable use."

Now, here we have quite £21,000 per annum additional wealth from only a small fraction of one section of the community. Of course, it is not likely that poultry will ever take precedence over all other industries; but it is patent that there are possibilities of revenue production in the poultry of Australasia which have never yet been developed.

TOBACCO IN VICTORIA.

IN order to encourage the growth and proper curing of tobacco, the Government of Victoria have offered a bonus of 3d. per lb. on all tobacco leaf exported from the colony, subject to the approval of Mr. Bondurant, the Government expert. The payment is not to be made on more than 3 tons to any grower. It is to be presumed that Mr. Bondurant will not pass any tobacco which is not sufficiently good in quality to do credit to the colony. Otherwise Victorian tobacco may start in European markets with a bad reputation from which it would be difficult to recover.

The blue mould has swept the majority of the tobacco crops of the King River clean away. This, following the glutted and low-priced market of last year, is a crushing blow to the industry. The fine crop of plants at the Experimental Farm has suffered. Mr. Bondurant said, when he first saw the blue mould (which is never experienced in the United States), that he thought the best remedy was to strengthen the plant itself, and he pointed out ways in which it was weakened here under the existing system. This is proved to be good advice. In one of the plantations on the King, a couple of acres of plants have resisted the mould. They are last year's plants, which, after cutting was done, had been covered up and left in the ground like hops. This is the custom frequently followed in Southern Europe. The plant revives from the old roots each year, and it is said that the crop improves every year. In a district like the King River, which suffers so severely from blue mould, this method should be worth a trial.—*Australasian*.

THE DEPOPULATION OF ENGLISH VILLAGES.

SPEAKING at a meeting of a Conference on Christian Economics at Birmingham in October last, the president, Mr. Walter Hazell, M.P., said there was no question of the reality of agricultural depression and evils that followed therefrom. The cause appeared to be the great abundance of produce, which was affecting farmers all over the world. Between 1875 and 1895 two million acres of land were laid down to grass, and a quarter of a million labourers with their families were displaced. Nowhere was the depression more keenly felt than in the village chapel. (Hear, hear.) Wherever a population was dependent upon agriculture, they found deeply-rooted depression. He thought something should be done to make life in the country more worth living. (Applause.) If that could be done, the country people would not be found anxious to migrate. They wanted a better Agricultural Holdings Act that would enable the farmer to get from his land the whole fruit of his industry, cheaper means of transit, State loans to provide for better dwellings and for the improvement of the land. There was also a need for farming education, the agriculturist being too strongly attached to old methods. Where dairying, fruit-growing, and market-gardening were practised, things were not at all bad.

The Rev. Dr. Paton, of Nottingham, having given figures to show the decline of the rural population in the last forty years, said the diminution had no parallel in any country in the world. One reason of the decline was that the democratic spirit of the age would not brook the dull monotony of country life and its servile conditions. The speaker uttered an eloquent aspiration for the yeoman class who furnished the men that made England great in the 15th, 16th, and 17th centuries. With the exception of a few hundred in Westmoreland and Lincolnshire, that race had entirely disappeared. There was no country in the world where the ownership of land was so divorced from occupancy as in this. Half the land in England was possessed by 2,250 landlords; two-thirds of Scotland was owned by 250 landlords. He contrasted this state of things with that existing in France, where there were 5,000,000 persons who owned $7\frac{1}{2}$ acres of land each, yielding maintenance and constituting a provision for old age. He called attention to the fact that out of 32,000,000 quarters of corn consumed in this country 24,000,000 were imported, and said that while we paid £4 per head for imported food the equivalent amount in Germany was only 7s. In case of war that state of things would involve grave risk. His remedy was the formation of farm colonies in which each family would have eight acres of land. That would enable them to keep four or five cows each, and still have plenty of space for crops. The land could be bought at £10 an acre, and 400 acres would found a colony of fifty farms. The price of each would be, with extras for roads and other works, £100. Six per cent. per annum would pay off interest and capital in twenty-five years. Each farmer would need a capital of £5 or £6 an acre; and the speaker attached great importance to the formation by a colony of a national credit bank. By means of such a bank, cottages could be erected at a cheap rate. Finally, Dr. Paton advocated the establishment of indoor industries for the winter months.

QUEENSLAND V. SCOTCH FARMING.

FARMING NOT REMUNERATIVE.

A BALANCE-SHEET has been placed in our (*Scottish Farmer*) hands of a small farm in Galloway, where strict accounts have been kept for many years, and the tenant knows what he is doing. It corroborates what has been said—viz., that no general rule can apply all round in the matter of profitable farming. The rent in this case is close on £1 10s. per imperial acre, and the soil consists of sharp, thin land, a good deal broken with boulders and jutting rocks, partly granite and partly blue-stone. Some years ago £140 was spent in liming, the proprietor and tenant sharing the cost between them. It is well farmed and managed, but does not pay, as the following figures will show:—

The income for the year ending May, 1897, amounted to £245 0s. 8d., derived from oats and oatmeal, cattle, sheep, wool, potatoes, pigs, dairy and poultry produce, amounting in all to £234 12s. 4d., with £10 8s. 4d. from miscellaneous sources. The expenditure amounted to £304 15s. 10d., including £18 for interest at 3 per cent. on capital; rent and taxes, about £120 10s.; manures, about £13 17s.; feeding stuffs, about £36 15s.; seeds, £7 10s.; labour, £93 10s.; and the balance for tradesmen's accounts. The loss was a fraction less than £60, so that this farm would barely have paid had the tenant had it rent free, because, it will be observed, he makes no charge for management or marketing, and £60 a year is a very poor wage for a man with £600 of capital. In the preceding year the loss was about £24, and only twice since 1890 have the accounts shown a slight balance on the right side. Obviously the tenant's lot is a hard one, and we can certify that his book-keeping is systematic and exhaustive.

[Had this farmer come out to Queensland in 1890, he would with his experience of farm management, probably have been amongst the successful wheat-farmers of 1897. Queensland lecturers have for years pointed out the advantages to be gained by coming to this colony, and yet here we find a man losing from £24 to £60 a year, year by year, who will probably never leave that farm till he enters the "union."—Ed. Q.A.J.]

AGRICULTURAL BANK.

THE Agricultural Bank is an institution that has been established by the Government of Western Australia, and our own Government might do worse than follow the example of the young colony in this respect. The object of this institution is to render temporary assistance to *bonâ fide* cultivators of the soil. By Act of the Legislature the bank is authorised to lend money, on the security of the land, for the sole purpose of carrying out necessary works of improvement, such as clearing, ploughing, fencing, draining, building, &c., which are approved as calculated to increase the value of the land. For these purposes the settler can obtain an advance of from £50 to £800, equal to one-half of the value of the improvements to be effected. The interest charged is 5 per cent. per annum, and repayment of the principal can be arranged on the easiest terms, not commencing until five years have elapsed, and then only at the rate of one-fiftieth of the amount every six months. It may be imagined that struggling settlers are not slow to avail themselves of this convenient means for carrying out the work of bringing their land into productive condition.—*Tweed Herald*.

PHYLLOXERA-RESISTING VINES.

THERE is a vigorous demand in Victoria for the phylloxera-resisting grape-vines imported by the Government for distribution; and it is already evident that the 50,000 cuttings available will not be nearly enough to supply requirements. One vigneron alone has applied for the whole number, and experts estimate that the Government will have to import at least 600,000 cuttings, and possibly 1,000,000, to satisfy present and prospective applications. This activity shows the importance which southern vignerons attach to the wine industry.—*Exchange*.

FOREST CONSERVANCY IN VICTORIA.

VICTORIA is at last bestirring itself in the matter of the proper conservation of its forests. A report of the Forest Commission has been prepared for submission to the Minister for Lands. In it attention is drawn to the destruction of valuable timber which has been going on in Victoria unchecked for many years, and to the absolute necessity of the Forest Department being given larger scope, so that extensive tracts which have been denuded of marketable timber may be restored. The commission recommends that the area of State forests should be largely increased, and, to secure the better preservation of young timber in reserves, more foresters should be employed, so that there may be a stricter supervision exercised over the cutting of trees. Unless this is done it is feared that the supplies of timber for mining purposes will soon run short, resulting in increased cost of mining operations owing to timber having to be brought from long distances.—*Sydney Stock and Station Journal*.

VALUE OF IRRIGATION.

IN his report to the Chief Engineer of the Victorian Water Supply Department, Mr. Thomas Murray, engineer to the department, says in reference to the irrigation of lands in the Northern districts of the colony:—

“The irrigated crops ranged from 3 feet 6 inches to 5 feet in height, and the yield of wheat from them was estimated at from 20 to 32 bushels per acre, the barley from 30 to 50 bushels, and the oats from 30 to 60 bushels. The unirrigated crops of wheat were estimated to produce from 4 to 10 bushels per acre, but the majority of them would average about 4 or 5 bushels. The area of the trust embraced 15,090 acres. This season thirty-seven farmers irrigated 4,135 acres of cereals. Some of the holdings were watered twice, and other three times. This season the gross value of the cereal crops in the district of the trust was estimated at upwards of £20,000. Had there been no irrigation, the total value would not probably have

exceeded £5,000. Mr. Murray brought down with him samples of the irrigated and unirrigated crops, and the difference between them was most marked. The cost of flooding the land was about 3s. an acre, and the value of the wheat from the irrigated land will be from £5 to £8 an acre; while on the unirrigated it will not come to more than £1 or £2 10s. Notwithstanding, however, that the farmers in the district will reap upwards of £20,000 from their produce this year, mainly through the water being brought to their holdings, they will not pay sufficient for the water to enable the trust to pay anything towards the interest on the money which it borrowed from the Government to carry out the irrigation."

AMOUNT OF BARBED WIRE REQUIRED FOR FENCES.

THE estimated number of pounds of barbed wire required to fence the spaces or distances mentioned with one, two, or three lines of wire, based upon each pound of wire measuring one rod ($16\frac{1}{2}$ feet), is as under:—

	1 Line.	2 Lines.	3 Lines.
1 square acre	50 $\frac{2}{3}$ lb.	101 $\frac{1}{3}$ lb.	152 lb.
1 side of a square acre	12 $\frac{2}{3}$ "	25 $\frac{1}{3}$ "	38 "
1 square half-acre ...	36 "	72 "	108 "
1 square mile ...	1,280 "	2,564 "	3,840 "
1 side of a square mile	320 "	640 "	960 "
1 rod in length ...	1 "	2 "	3 "
100 rods in length ...	100 "	200 "	300 "
100 feet in length ...	6 $\frac{1}{16}$ "	12 $\frac{1}{8}$ "	18 $\frac{3}{16}$ "

VICTORIAN GRAPES.

By the s.s. "Bothnia" the record shipment of grapes from the Bendigo district was sent to London from the vineyard of Mr. G. W. Knight, Epsom. Among the varieties included are Knight's Centennial, Raisins des Dames, White Neurillon, Muscat Hambro, Waltham Cross, and Red Prince.

HOW TO MEASURE AN ACRE.

FARMERS would often be glad to know the area of oddly-shaped fields without having recourse to a surveyor. The following may prove of some use:—Five yards wide by 988 yards long contains one acre; 10 yards wide by 484 yards long contains one acre; 40 yards wide by 121 yards long contains one acre; 70 yards wide by 69 $\frac{1}{2}$ yards long contains one acre; 80 yards wide by 60 $\frac{1}{2}$ yards long contains one acre; 60 feet wide by 726 feet long contains one acre; 110 feet wide by 397 feet long contains one acre; 130 feet wide by 363 feet long contains one acre; 220 feet wide by 181 $\frac{1}{2}$ feet long contains one acre; 440 feet wide by 99 feet long contains one acre.

BEE-KEEPING IN NEW SOUTH WALES.

THE *Statistical Register* gives some interesting information concerning agriculture in the neighbouring colony. The statistics are given up to the year ending 31st March, 1896. The number of hives in New South Wales for the year ending 31st March, 1896, is returned as 27,392 productive, 10,350 unproductive; yield of honey, 1,123,209 lb.; average per hive, 41 lb.; yield of beeswax, 27,520 lb. The hives are distributed thus:—Northern division: Productive, 10,101; unproductive, 2,936. Central: Productive, 10,956; unproductive, 4,787. Southern: Productive, 6,324; unproductive, 2,625. Western: Productive, 11; unproductive, 2. The average market price per month in Sydney throughout the year has been uniform, at 2 $\frac{3}{4}$ d. per lb.

PRESERVING FRUIT.

It is perhaps not widely known that fruit may be preserved without boiling, heating, or drying. All that is necessary is to alternate the fruit between layers of sugar. The sugar, however, must exceed the weight of the fruit by one-half.

NEW ZEALAND BUTTER.

ON the 6th November last a shipment of butter was made from New Zealand per s.s. "Ionic" for England, which we believe is a record for that colony. 16,703 boxes and 743 kegs were shipped, and of this quantity Wellington is credited with 14,168 boxes and 60 kegs. In Queensland a box of butter weighs 56 lb. net, the tare on the total weight of butter and box being about 12 lb. Supposing the New Zealand box to be of the same dimensions as our own, the shipment in boxes amounts to over 417 tons. No butter is shipped in kegs from Queensland, but the New Zealand keg probably holds 80 lb. net, making an additional $26\frac{1}{2}$ tons, or a total of $443\frac{1}{2}$ tons.

SHIPPING FRUIT.

A SCHEME by a Colorado man is founded on the principle that dry, fresh air is far more beneficial to fruit in transit than is the moist and confined air of a refrigerator car. In the new car, ice is done away with. An immense metal funnel is attached to the engine of a train, just above the pilot, and from this funnel a pipe, about 1 foot in diameter, extends back to the fruit-car, resulting in an automatic draught of air flowing through the car. This, it is claimed, makes a perfect ventilation, and, according to the dry-air theory, will preserve fruit for several days longer than the ice process.—*California Fruit Grower*.

AUSTRALIAN RABBITS.

ATTENTION is called by the Colonial Consignment Company to the great increase in the imports of rabbits from Australasia which has taken place this year. During the ten months ending with October, 150,463 cwt. of rabbits have been received from Australia and New Zealand, as compared with 60,255 cwt. and 21,811 cwt. for the corresponding periods of 1896 and 1895. Such a great contribution, it is remarked, could not fail to have a marked effect upon the consumption of frozen meat, the trade for which has been very dull for some time past. Frozen mutton is selling at $2\frac{3}{4}$ d. (or even less for some lots) to $3\frac{1}{4}$ d. per lb. for the very best Canterbury, and beef at $1\frac{3}{4}$ d. to $2\frac{1}{4}$ d. With such prices current in the wholesale market, the poorest of consumers should not lack meat.—*Standard*.

MALTING BARLEY.

THE Neerandra correspondent of the *Warwick Argus* says there is great demand in the district for malting barley. Representatives of various malting-houses have been "doing" the farms of Warwick in quest of samples of Chevalier barley. Fancy prices are quoted which will warrant farmers in paying more attention to the growth of this cereal this year. But growers should not lose sight of the fact that Warwick has its own malting-house, erected at great expense, and which should receive the support of every farming centre in the Warwick district. By supplying its local maltsters, the farmers will be helping themselves.

In this connection we learn from the *Toowoomba Chronicle* that Messrs. Perkins and Co. intend building another malt-house, so as to enable them to malt for all their breweries.

SHOW FIXTURES.

Drayton and Toowoomba Agricultural and Horticultural Society	... ..	12th January, 1898.
Central Downs Agricultural and Horticultural Association	... ..	2nd February, 1898.
Eastern Downs Agricultural and Horticultural Association (Warwick)	... ..	9th and 10th February, 1898.

The Markets.

AVERAGE PRICES FOR NOVEMBER.

Article.									NOVEMBER.		
									Top Prices.		
									£	s.	d.
Bacon	...	...	...	...	...	...	...	lb.	0	0	7
Bran	...	...	...	...	...	...	...	ton	3	15	0
Butter, First	...	...	...	...	...	...	...	lb.	0	0	8 ⁵ / ₁₆
Butter, Second	...	...	...	...	...	...	...	"	0	0	4 ¹ / ₂
Chaff, Mixed	...	...	...	...	...	...	...	ton	3	13	6
Chaff, Oaten	...	...	...	...	...	...	...	"	4	16	3
Chaff, Lucerne	...	...	...	...	...	...	...	"	2	10	0
Chaff, Wheaten	...	...	...	...	...	...	...	"	2	17	6
Cheese	...	...	...	...	...	...	...	lb.	0	0	5 ⁷ / ₈
Flour	...	...	...	...	...	...	...	ton	14	15	0
Hay, Oaten	...	...	...	...	...	...	...	"	4	7	6
Hay, Lucerne	...	...	...	...	...	...	...	"	1	13	1 ¹ / ₂
Honey	...	...	...	...	...	...	...	lb.	0	0	1 ^{1.5} / ₁₆
Japan Rice, Bond	...	...	...	...	...	...	...	ton	13	10	0
Maize	...	...	...	...	...	...	...	bus.	0	2	4
Oats	...	...	...	...	...	...	...	"	0	3	7 ³ / ₄
Pollard	...	...	...	...	...	...	...	ton	3	15	0
Potatoes	...	...	...	...	...	...	...	"	3	8	9
Potatoes, Sweet	...	...	...	...	...	...	...	"	2	1	3
Pumpkins	...	...	...	...	...	...	...	"	2	15	0
Sugar, White	...	...	...	...	...	...	...	"	15	12	6
Sugar, Yellow	...	...	...	...	...	...	...	"	13	12	6
Sugar, Ration	...	...	...	...	...	...	...	"	11	12	6
Wheat	...	...	...	...	...	...	...	bus.	0	5	5 ¹ / ₄
Onions	...	...	...	...	...	...	...	cwt.	0	13	6
Hams	...	...	...	...	...	...	...	lb.	0	0	8 ⁵ / ₈
Eggs	...	...	...	...	...	...	...	doz.	0	0	6 ³ / ₈
Fowls	...	...	...	...	...	...	...	pair	0	4	2 ¹ / ₄
Geese	...	...	...	...	...	...	...	"	0	6	4 ¹ / ₂
Ducks, English	...	...	...	...	...	...	...	"	0	3	9
Ducks, Muscovy	...	...	...	...	...	...	...	"	0	5	4 ¹ / ₂
Turkeys, Hens	...	...	...	...	...	...	...	"	0	7	3
Turkeys, Gobblers	...	...	...	...	...	...	...	"	0	18	10 ¹ / ₂

FROZEN MEAT MARKET.

LATEST QUOTATIONS.

London, December 11.

THE following are latest quotations for the various descriptions of frozen meat mentioned:—

New Zealand Mutton (crossbred wethers and maiden ewes).—Canterbury, 3 ¹/₁₆d. per lb.; Dunedin and Southland, 2 ^{1.3}/₁₆d.; North Island, 2 ^{1.1}/₁₆d.
Australian Mutton (crossbred or merino wethers).—Heavy (over 50 lb.), 2¹/₂d. per lb.; light (under 50 lb.), 2¹/₂d.

River Plate Mutton (crossbred or merino wethers).—Heavy, $2\frac{1}{2}$ d. per lb.; light, $2\frac{1}{2}$ d.

Australian Frozen Beef.—Prime ox, forequarters, $2\frac{3}{8}$ d. per lb.; ditto hind-quarters, $2\frac{7}{8}$ d. Secondary, fores, $2\frac{1}{8}$ d.; hinds, $2\frac{5}{8}$ d.

The above prices are the official quotations furnished by the Frozen Meat Trade Association. The basis of quotations is sales of lines of not less than 100 carcasses of mutton or lamb, or 100 quarters of beef. All the quotations for mutton are for fair average quality. Quotations for New Zealand and Australian lambs do not include sales of small lambs, or heavies or inferior quality.

THE WHEAT CROP OF 1897.

From the latest reports we have received respecting the wheat crop, much encouragement is to be derived. On the Darling Downs the early crop has proved a marked success. Some rust was perceivable, but, on the whole, farmers have no reason to complain of the returns from early-sown wheat.

The grain is plump and well developed, and will command a fair price.

The later-sown wheat is, in many cases, a failure. Much was badly rusted, and had to be cut either for hay or to be burnt off to make room for a maize crop. What was reaped for grain resulted in pinched grain of little value. This was largely owing to abnormal heat, following on heavy rains, which resulted in practically burning up the ear. It is remarkable that in many paddocks well-developed grain is found in conjunction with pinched grain. Hence it is with the greatest difficulty that a farmer can state how much pinched grain and how much fully developed he can guarantee. Some say it amounts to about half-and-half.

To come to prices, the millers value the pinched grain at 3s. 6d. per bushel, and the full at 4s., delivered on the trucks at any station on the Downs. The average price, taking the value of inferior and full grain, is 3s. 10d. per bushel. To a Brisbane miller this would mean 4s. $1\frac{1}{2}$ d. per bushel, the freight from, say, Pittsworth to Brisbane being about $3\frac{1}{2}$ d. per bushel.

Neither can the mill-owners on the Downs afford more. They have to send all the bran and pollard to the metropolis, as there is no sale worth mentioning for their by-products in the West. There is a little sale in Toowoomba and Warwick, but the bulk comes to Brisbane and thence to North Queensland. With respect to the yield as compared with last year, the crop for 1896 amounted to 680,000 bushels. This year it is confidently estimated by competent judges that the yield will reach 800,000 bushels—that is, the quantity which will be available for sale to Queensland millers. Besides this, the farmers will be able to retain the necessary quantity of seed for next season.

The average yield is estimated at 12 bushels, but this includes the pinched grain, which, of necessity, must bring down an average which on some farms has amounted to between 30 and 40 bushels per acre.

One thing greatly in favour of the harvest this year was that as a rule splendid weather prevailed during the harvest. During the latter part of the harvest, when practically all the wheat was stacked, heavy rains came on and nine inches of rain fell in seven days. Hundreds of stacks were badly built, and many unthatched, and these suffered in consequence. Three inches of rain fell in one night. The loss will probably be very great so far as the uncovered stacks are concerned. So badly, in many instances, were the sheaves stooked, that they were actually bound together by the green growth, and had to be torn asunder. When will farmers learn to cap their stooks and thatch their stacks?

The latest news from New South Wales puts the year's yield of wheat at 9,100,000 bushels; whilst from South Australia we glean from the market report of Messrs. John Darling and Sons, kindly supplied to us by Mr. Archibald (Dominion Milling Company, Brisbane), that, "on the whole, the weather has

continued very favourable for reaping, and, in consequence, the deliveries of new crop are on a very small scale. There is great variety as to quality, and the trade have considerable difficulty in arranging the different values of the varieties offering. What may be considered about the basis of new wheat f.o.b. to-day would command about 4s. 8d., Port Adelaide; 4s. 3d., 4s. 4d., and 4s. 5d. at the outports, according to time of delivery and position of outport. The trade do not seem in any way anxious to go into stock, as there seems to be a general consensus of opinion that South Australia will produce more than sufficient for home consumption and seed requirements this year, and that, if we are to export the surplus that is above this, our markets will require to be in keeping with those of our competitors, so as to enable us to secure a share of the requirements of our usual customers. It is difficult to foretell as to what the future of the market is likely to be, as until reaping is completed in all colonies it is more or less guesswork to form an idea as to what surplus Australasia is likely to have for export (if any). The idea generally is that when deliveries commence on a free scale the prices will probably be on the basis of about 4s. 6d., Port Adelaide; 4s. 9d., Melbourne; and 4s. to 4s. 3d., Sydney; but it depends very much upon the quality and the yield to be ascertained when cleaning up takes place as to how these prices may vary. Old wheat has been in demand; but owing to purchases recently made in Riverina, and now in course of delivery, it is considered that the demand has been fully met. Values of old wheat may be quoted nominally: Port Adelaide to-day at 5s. to 5s. 2d. per bushel; in Melbourne value of old wheat may be given as 5s. 2d. to 5s. 3d.; in Sydney old wheat would be worth about 4s. 5d. With continued favourable reaping weather in Victoria and New South Wales, we can hardly look for free deliveries of new crop until after new year, and prices will be more or less uncertain and unsettled until that period." At Port Adelaide there is a duty of 1s. 2½d. per bushel.

On the Darling Downs threshing has only started this week (20th December); but work is in full swing, and a very large quantity will be separated from the straw during the next three or four weeks.

Barley.—There is a very good crop of Chevalier barley on the Downs. It has been well saved. None has been threshed yet, but, the quality being good, there will be a large quantity likely to be bought by the maltsters. The price will probably touch 4s. per bushel for the best Chevalier samples. The success of the crop this season will probably lead to an increase of acreage under barley next year.

Farm and Garden Notes for January.

THE principal work in the field during this month will consist in ploughing and preparing the land for future crops. Particular care should be given to destroying all weeds before they seed. This will save much cleaning afterwards. Maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum or setaria, teosinte, rye, and cow peas, if the weather will permit. Early potatoes may be planted whole, but they must have plenty of room, or they will be drawn up; and in any case such early planting can only be looked upon as an experiment which may or may not be successful.

Kitchen Garden.—The great heat of the weather during the present month will militate greatly against successful sowings of seeds; but with care much may be done. Shading and watering are the main points to be attended to. Vegetable beds should be freely watered in the evening. A mere sprinkling is useless. The beds should receive a good soaking. Mulching will be found of great benefit, and also a slight dressing of salt. The mulch may consist of stable litter, tan, straw, or grass. All unoccupied land should be dug, and green refuse, such as cabbage leaves, turnip tops, &c., turned under, as they form a valuable manure. Heavy land should be turned over, the lumps broken roughly, as the exposure to the sun will greatly improve the texture of such soils. When the weather is favourable, sow French beans, cress, cauliflower, mustard, cabbage, celery, radish, for autumn and winter use. Parsnip, parsley, radish, turnip, Brussels sprouts, carrot, peas, and endive may be sown, as well as a few cucumber and melon seeds for late crop; the latter are, however, not likely to succeed except in very favourable situations. Such seeds as cabbage, cauliflower, celery, &c., should be sown thickly in small beds under a light covering of canvas or brush, and the beds kept well watered until the plants are strong. In favourable weather plant out cabbage and cauliflower. Gather herbs for drying. Gather onions, garlic, and eschalots as the tops die down. When planting out cabbage, &c., protect the plant from the sun for a few days until the new roots are formed.

Flower Garden.—Sowings should be made in boxes under cover or in sheltered prepared seed-beds for early plants—cineraria, primula, gloxinia, calceolaria, pansy; for late blooming—Sweet William, calendula, balsam, gaillardia, zinnia, coreopsis, dianthus, &c. Tie up and stake all tall-growing plants. Dahlias that are in flower may be thinned out and tied to stakes. Weeds must be kept down, and, to keep up a good show of flowers, constant watering and attention will be necessary, especially if the weather is hot. Plant dahlia bulbs for late blooming, if not already done; also make cuttings of any good variety from medium-grown wood, planting same in sandy soil under fair circumstances, thus getting nice healthy young bulbs for next season.

Orchard Notes for January.

By ALBERT H. BENSON.

THE Orchard Notes for the month of December apply equally to that of January, especially the remarks anent the handling and marketing of fruit and the treatment of various fruit pests. The fruit of the month is the grape, and growers should take every care to market this fruit properly. The fruit should be cut when dry and cool before the heat of the day, and should be firmly packed into cases of moderate size, as if the grapes are at all tender they are apt to be badly crushed if packed in too large cases. For shipping high-class grapes such as Black Muscat of Alexandria, White Muscat of Alexandria, Waltham Cross, or even Raisin de Dames, I strongly advise growers to use 5-lb. chip baskets, eight or ten of which go to a crate, as the fruit carries better in them and will reach its destination with the bloom on if well packed and carefully handled. The fruit should be sold in the chip basket, so that the purchaser gets the grapes as packed in the vineyard and without being handled by the retailer. This method of packing grapes is common in California, especially where the fruit has to be shipped long distances; and as our best grapes here come from the Roma and Mitchell districts, and are often more or less damaged in transit, it should be of value to us in that it would enable the fruit to be marketed in a better and fresher condition than is the case at present.

I do not think such chip baskets are obtainable in Queensland, but if not they could be easily introduced, as they are now coming into regular use in Melbourne.

Mangoes will also be ripening in the Southern part of the colony towards the end of the month, and I strongly advise if any are to be shipped to the Southern colonies that none be sent unless they are of good quality, as the carrot-flavoured stringy rubbish that has been sent in the past has simply killed the demand for mangoes in the Southern markets, and it will be impossible to open up a trade for our fruit there unless it is of good quality, and this good quality must be maintained. As there is a great deal of uncertainty as to what constitutes a good mango, I may say briefly that a good mango should be fibreless or nearly so, and should have no pronounced unpleasant flavour of carrots or turpentine, but should be either a luscious high-flavoured fruit or a juicy, good-flavoured, sprightly fruit. Too large mangoes are not an advantage, a round mango of 6 to 8 oz. weight being about the best size and shape for packing and carrying.

As no record or description of Queensland-grown mangoes has ever been published that I am aware of, and as there is considerable uncertainty as to the best varieties of mangoes to grow, I would be glad to receive samples of the fruit and foliage of any mangoes that the grower may consider to be of special merit, with a view to making drawings of and keeping a complete record of same, so that we may have reliable information as to the best varieties of mangoes in the colony, and know which are best to propagate. In addition to sending the fruit and foliage, I would be glad for the grower to supply information respecting the source from which the tree producing the fruit was derived, the nature and habit of growth of the tree, whether it is a good or bad cropper, and the class of soil it is growing in.

During the month see that the orchard is kept well cultivated, and in dry districts, where there is water available, citrus trees should receive a good irrigation. Keep the nursery clean, look after all grafts or spring buds, and see that they are growing clean and straight, and where strong enough head back at the height at which it is desired to form the head of the tree. Budding of all kinds of fruit trees can be done during the month, the only requisites to success being that the buds are fully developed and that the bark of the stock runs freely. For budding use a very sharp knife, and see that you cut your buds thin—*on no account remove the wood from the bud*, as it only makes the operation slower and does no good; in fact, the quicker the budding is done, and the less the inner bark of the bud or stock is exposed, the better will be the take. Always tie your buds firmly, especially so at the base of the bud, as it is there that the union must take place. As soon as the bud has taken properly, the ties should be cut; otherwise they are very apt to cut into and destroy the stock.

Tropical Farm and Garden Notes for January.

HEAVY rains may be expected during this month. Surface drainage should receive attention—the rain waters directed into their natural channels, across which, wherever practicable, weirs of logs or stones should be placed to prevent the washing away of the soil. The growth of vegetation is very rapid. Cuttings of Guinea grass may be made for ensilage. Silos should be under cover and drained. If the weather is favourable, coffee plants may be advanced to the field; showery weather should prevail. During heavier rains, indoor or shed work can be found putting garden and field tools and implements in good order. Mango seeds should be planted immediately after the fruit is eaten. It is better to plant them where the tree is to grow. Budding and grafting orange and other citrus fruits can be undertaken. Bread fruit (*Artocarpus incisa*) will ripen. Whenever root plants appear above ground, they should be removed to the grove.

The rainfall average during the month of January for the past eight years was 17·309 inches. The mean temperature for the month extending over the same period is 81·4 degrees. These observations are made at Kamerunga.

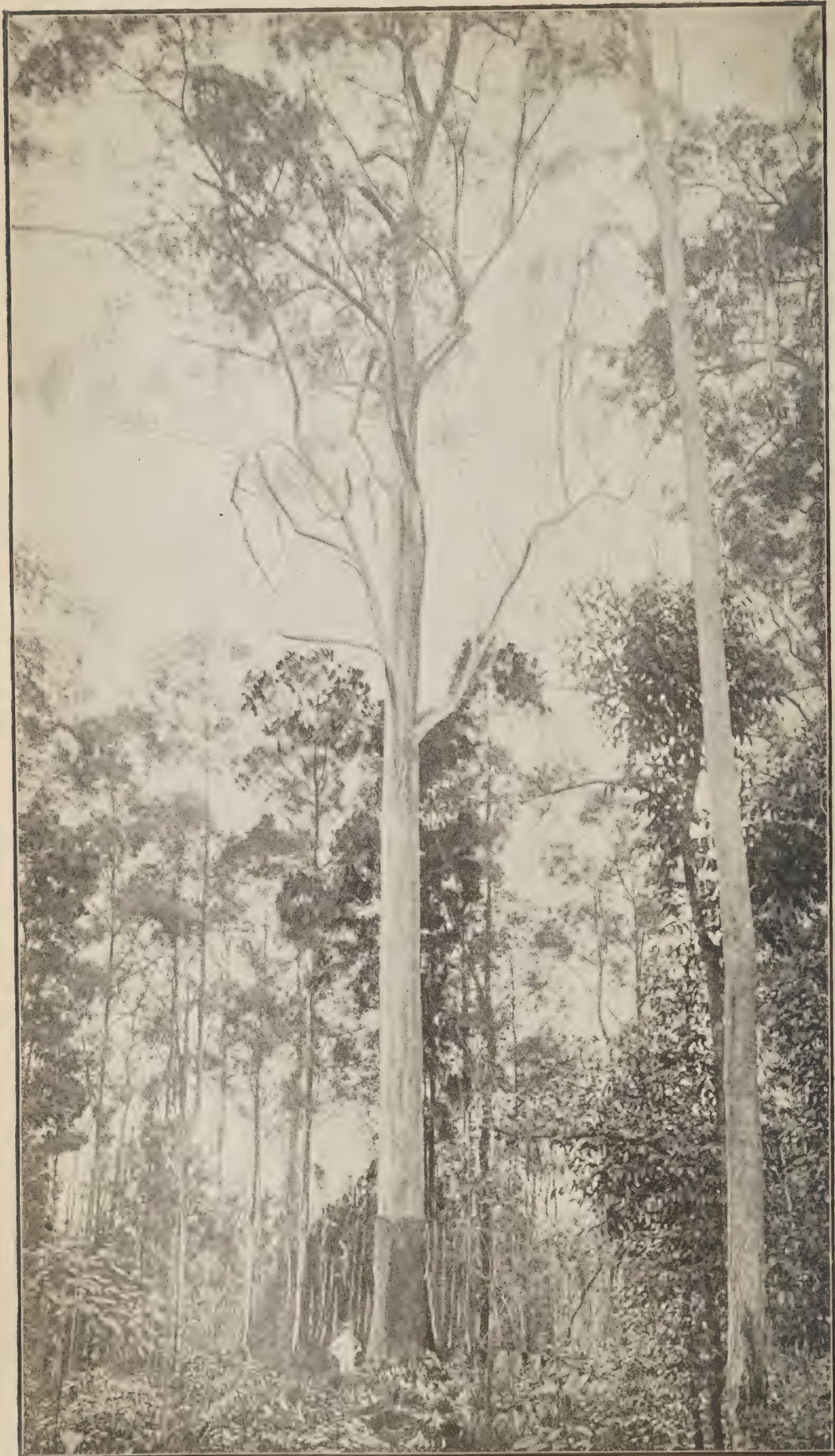
Publication Received.

WE have received from the editor, Mr. L. Lindley-Cowen, Parts 1 to 4 of "The West Australian Settlers' Guide and Farmers' Handbook." The work is excellently arranged, and written in a pleasing and readable style. A very large fund of useful and valuable information is contained in its pages, whilst the illustrations are excellent. With such clear, practical instruction in selecting land, and in utilising it to the best advantage afterwards, no settler of average intelligence should fall into serious mistakes, even at the outset. We congratulate Mr. Lindley-Cowen on this very useful work.

LIST OF ERRATA IN "INSECT FRIENDS AND INSECT FOES."

(*Queensland Agricultural Journal*, 1 December, 1897, Vol. I., No. 6.)

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- Page 465—For "develoment," read "development."
- Page 466—For "and thus taken steps to ensure their preparation," read "and thus taken steps to ensure their perpetuation."
- Page 467—For "geological feature," read "geological formation."
- Page 467—For "those that are directly useful, and such as," read "those that are directly useful such as."
- Page 467—For "*Trigoria*," read "*Trigona*."
- Page 468—For "Government Entomologist of Australia," read "Government Entomologist of Victoria."
- Page 468—For "*F. pilachna*," read "*Epilachna*."
- Page 468—For "Poneneridæ," read "Poneridæ."
- Page 468—For "*Æcophylla*," read "*Æcophylla*."
- Page 468—For "Mutillæ," read "Mutillidæ."
- Page 468—For "*Parasitic Insects*—These are almost exclusively members of two orders of insects—viz., Coleoptera (Beetles)," read "*Parasitic Insects*—These are almost exclusively members of two orders of insects—viz., Hymenoptera."
- Page 469—For "*Cryptotæmus*," read "*Cryptotæmus*."
- Page 469—For "Report," read "Report on Insect and Fungus Pests."
- Page 469—For the verse finding place here, substitute the following corrected and supplemented edition—that of the well-known mathematician, A. de Morgan :—
- "Great fleas have little fleas upon their backs to bite 'em,
And little fleas have lesser fleas, and so on *ad infinitum*;
And the great fleas themselves, in turn, have greater fleas to go on;
While these again have greater still, and greater still, and so on."
- Page 470—For "Beyond this outcome of his knowledge that will reach him," read "Beyond this outcome of his knowledge that will teach him."
- Page 470—For "the predaceous insects or parasite," read "the predaceous insect or parasite."
- Page 470—For "*Novis*," read "*Novius*."
- Page 470—For "to New Zealand. With the object of effecting by this means, the fertilisation of the Red Clover, in 1874 efforts were made," read "to New Zealand, with the object of effecting by this means the fertilisation of the Red Clover. In 1874 efforts were made."
- Page 471—For "*Aphidius brassica*," read "*Aphidius brassica*."
- Page 471—For "*Semiotellus Nigriceps*," read "*Semiotellus nigriceps*."
- Page 471—For "*Platygaster Minutus*," read "*Platygaster minutus*."
- Page 471—For "become established.† Although the figure," read "become established :† although the figure."
- Page 471—For "*Ceroplastes rubra*, Mast.," read "*Ceroplastes rubra*, Mask."
- Page 471—For "Chaleidid," read "Chalcidid."
- Page 471—For "*Plucella cruciferarum*," read "*Plutella cruciferarum*."
- Page 472—For "*D. Ceriferus*," read "*D. ceriferus*."



EUCALYPTUS BOTRYOIDES. WOOLLY-BUTT.

The Wheat Crop of 1897.

NOTES ON THE SITUATION.

THE question which is now of paramount importance to wheatgrowers is: What are the prospects as to prices? To answer the question in some degree it is necessary to look beyond Australasia, and, shortly summarising the state of the wheat crops and markets of the world, it may be gathered that unless some unforeseen contingency—a new source of supply—should spring from some unknown quarter, the price of wheat will harden. We now know pretty well the best and the worst of the Australasian wheat crop for 1897. Queensland has produced a record crop estimated at 800,000 bushels, but she will require some 2,000,000 bushels additional to supply the present year's requirements. Whence is it to come? Not from Victoria, which has had what may be called a disastrous season owing to the continued dry weather. South Australia has come out equally badly for the same reason. New South Wales is better off, and will be able to export, according to the forecast of the Government Statistician, 345,000 bushels. New Zealand has had a short crop owing to drought. Thus it is useless to look for any large imports to Queensland from the neighbouring colonies, for taking them as a whole the crop has fallen short of requirements by some 3,000,000 bushels. Now let us look ahead. What do we find?

From the most reliable journals dealing with the grain trade of the world, we learn that the available supply for 1898 is 35,000,000 quarters below that of 1891, a so-called famine year. Meanwhile the consumption has increased by 15,000,000 quarters. The *Australasian* says:—The total is 29,000,000 quarters less than that of 1896 (a year of great deficiency and reserve depletion), 47,000,000 less than that of 1895, 62,000,000 below that of 1891, and 51,000,000 below that of 1893. So far prices in the home market have not declined. On the contrary, the prices of Russian and Californian wheat have advanced. The amount of wheat visible in the United States and Canada is reported at 50,000,000 bushels, or 34,000,000 less than the stocks held in 1896. The Bureau of Agriculture at Washington gives the total crop for the United States at 530,000,000 bushels.

Then we come to the Argentine. Here the locusts have been devastating the crops.

In Roumania the shipments this year will fall short by almost the amount of last year's exports, and it appears as if the importing countries will be almost entirely dependent upon two exporting countries—North America and Russia—for their supplies from abroad.

The wheat harvests of the leading countries, as given by the *Mark Lane Express*, are now fairly well ascertained, and thus compare—

	1896. Qr.	1897. Qr.
The United Kingdom	7,300,000	6,760,000
France	41,000,000	30,000,000
Germany	13,780,000	14,468,400
Austria-Hungary	23,920,000	21,528,000
Russia	49,740,000	39,792,000
Italy	16,800,000	13,440,000
The United States of America ...	58,380,000	64,750,000

Thus the total for 1897 is 190,738,400 quarters, a deficiency of 20,181,600 quarters, or 161,452,800 bushels.

It appears that the report relating to the Russian crops emanated from a Russian paper, in which a great mistake had been made in an attempt to extend the official estimates, as to yield, given in total by the Ministry for Agriculture for only the fifty Governments of Russia proper, to Poland and the Caucasus, in respect of which only rough estimates of percentage decrease on the average yield per acre were issued. The statistics sent direct from the Ministry to the *Corn Trade News*, converted into measured quarters, are as follows, for Russia in Europe (exclusive of Poland) only :—

	1895. Qr.	1896. Qr.	1897. Qr.
Wheat 	28,944,000	27,216,000	22,530,000

Here we have a deficiency, comparing the wheat crop in Russia proper for 1897 with that of 1896, approaching 5,000,000 quarters, instead of the small deficiency indicated by the unauthorised extension of the figures to a much larger portion of the Empire, and a comparison of the total with the 1896 crop on a still larger area, given in the Russian paper. The Ministry of Agriculture estimates the crop of Russia proper at 17 per cent. less than the previous year's production, and this reckoning, applied to the total for the whole Empire, as given in the final estimate of the Bureau of Statistics for 1896, or 48,455,000 quarters, would make the crop in the Empire, for 1897, about 40,000,000 quarters, or between 8,000,000 and 9,000,000 less than the previous year's crop. The deficiency in the rye crop is still more serious. Again, the report that South Australia will have no surplus is confirmed, and Argentine papers just received contain accounts of increasing destruction by locusts, confirmed by some telegrams, and ignored by others. On the other hand, the wheat crop in India has had a capital start.

Taking the present position of affairs in the wheat markets of the world, it would appear reasonable to look for a hardening market in the near future.

Co-operative Bacon Factories.

THE benefits to be derived from co-operation have so often been written upon, explained, and definitely proved, that it would seem superfluous to again allude to the question. Still there is, amongst many other industries, one which should commend itself strongly to agriculturists as a valuable object for co-operation. There are very few holdings, large or small, on which swine are not kept, either for domestic use or for sale; and one of the complaints of the farmers is that, although occasionally good prices are obtained for pigs, as a rule, they are obliged to take whatever price is offered by the butcher, the factory, or the middleman, or else let the animals eat their heads off till the market improves.

In view of this state of affairs, why cannot the farmers in a district combine and start a co-operative factory for the curing of hams and bacon?

We lately heard a great deal of the dairying industry of Denmark, and we know that their butter fetches a very high price in England. But, besides being dairymen, the Danes are also exporters of ham and bacon, which commodities are prepared in co-operative factories, run by the farmers. As in Queensland, co-operative sugar-mills, or central mills as they are called, are erected with money borrowed from the Government on the security of the farmers' lands, so in Denmark the cost of establishing bacon-curing factories is defrayed by loans raised on security given by the promoters of the work.

Every member, as in the case of Queensland sugar-mills, becomes a guarantor for a certain amount. The regulations of these factories are briefly stated in the *Journal of the Board of Agriculture*, and are to the following effect:—

It is usually stipulated that the members of the association shall deliver all their saleable swine to the factory for a fixed period of seven years, except in the case of removal from the districts. This stipulation, however, does not apply to boars, to sows in farrow, or to young pigs under 56 lb. (in some cases 112 lb.) live weight, nor does it extend to pigs sold by a member to his labourers or consumed in his own house. A corresponding obligation is nearly always imposed on the association to accept all the healthy swine consigned by a member to the factory.

A member may purchase any number of pigs from another member of the association, and send them to the factory, provided he has fattened them for a period varying from twenty to thirty days before delivery. But he is not allowed to send in one year more than ten pigs purchased from non-members. The association usually defrays the expenses incurred in conveying the swine from the nearest railway station to the factory. All other charges for carriage are paid by the consignors.

On removal to the factory, the pigs are divided into classes according to quality, the values of the different classes being fixed weekly by the council on the advice of the manager. In some cases the prices are paid by dead weight, but in the older establishments payment by live weight is still in practice. The offal is generally sold to the members of the association, or to the general public at the current prices of the day.

The regulations do not, as a rule, contain any restrictions on the methods of feeding swine intended for the factories. Sometimes, however, the employment of fish and fish cake is prohibited, as is also the use of a ration containing more than 50 per cent. of maize.

Whenever it is found that the supply of swine is falling off, the manager of the factory is empowered to purchase pigs from non-members of the association at a price fixed weekly by the council and posted up for the information of members.

At the close of the year, the profits arising from the operations of the association are distributed amongst the members, after provision has been made for the payment of the working expenses, the allocation of a certain sum to the reserve fund, and the part payment of loans. Each member receives a share of the profits in proportion to the weight of pork he has delivered during the year. The amount carried to the reserve fund is determined annually by the council.

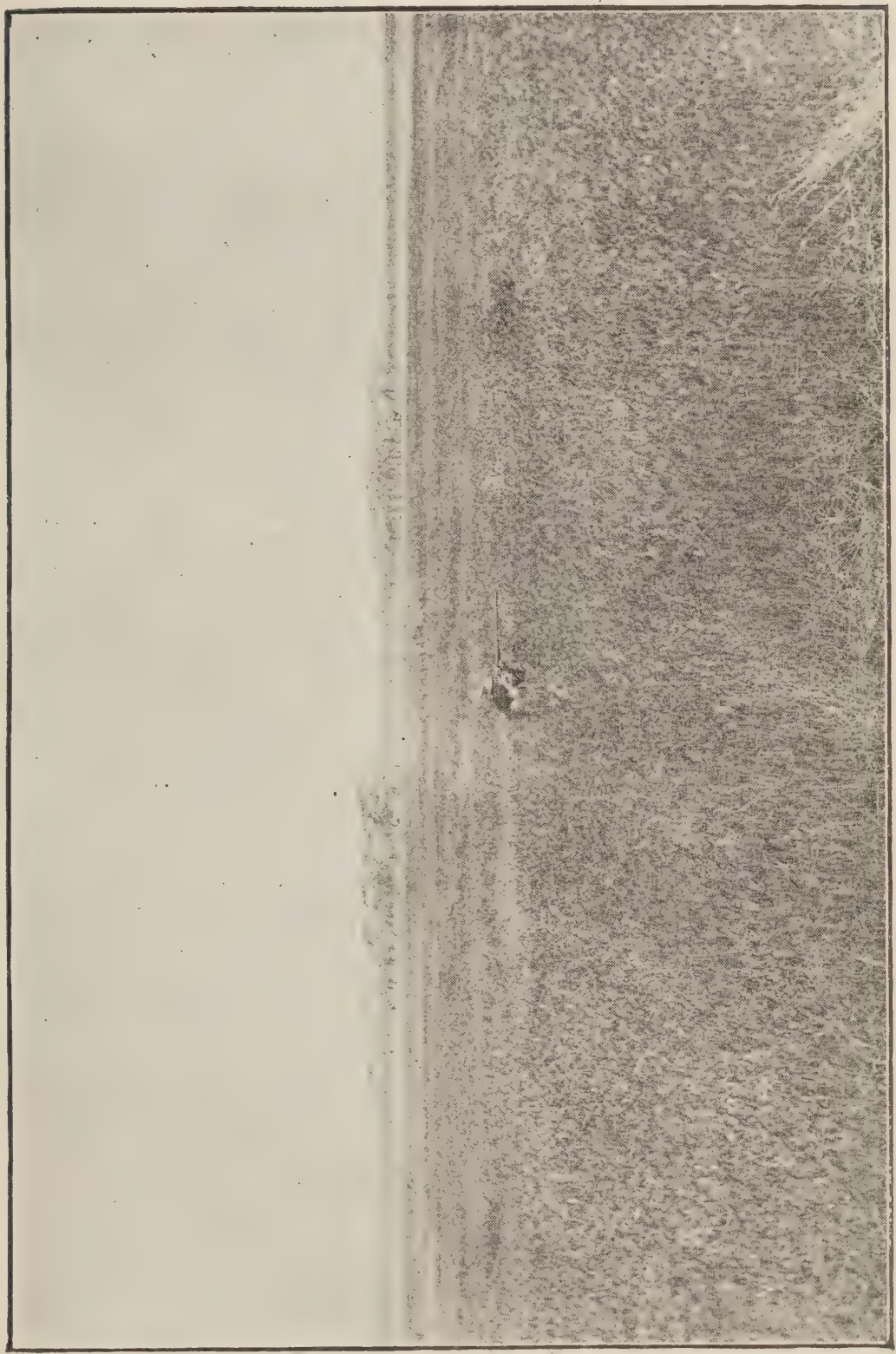
Agriculture.

TO KEEP SWEET POTATOES.

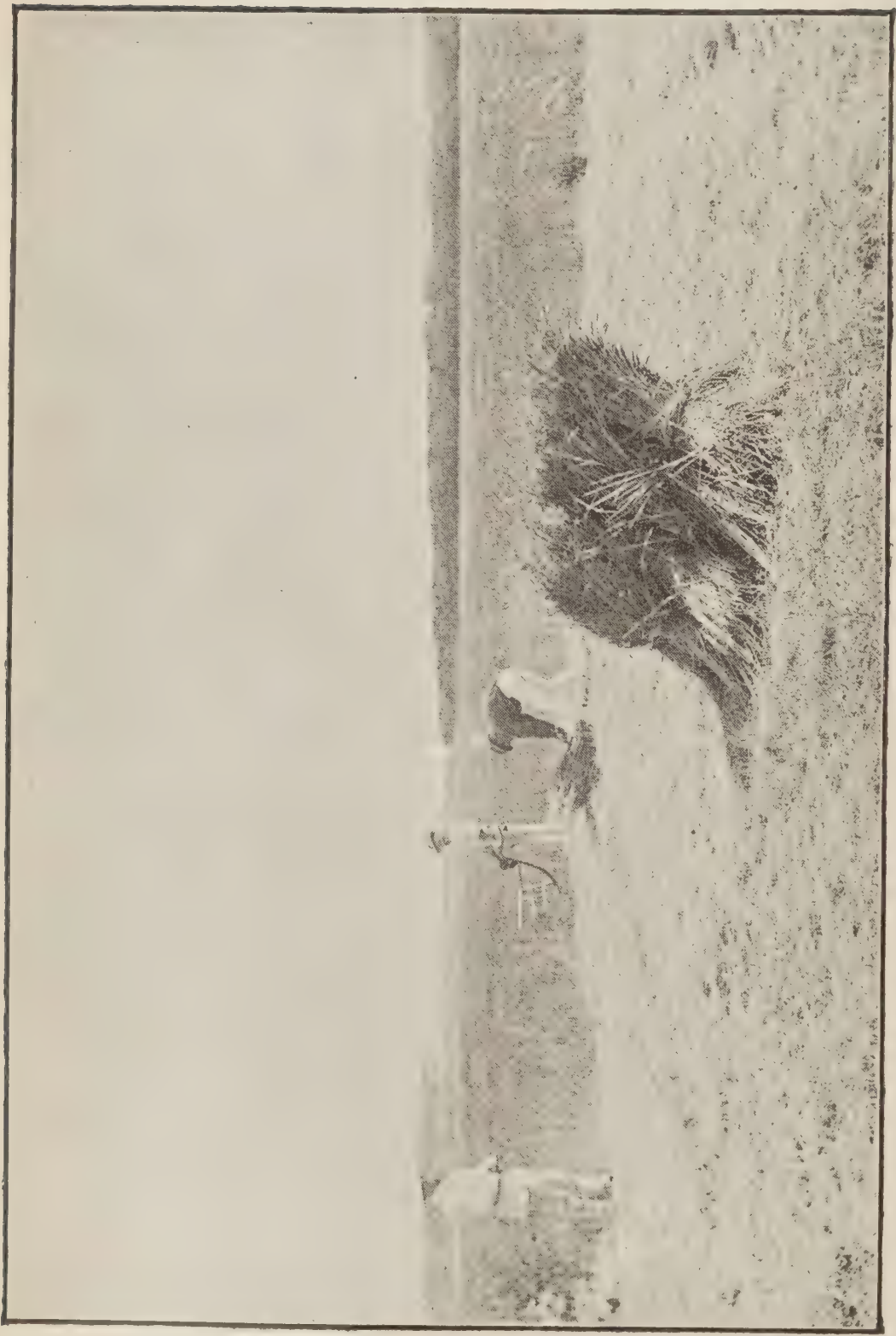
THERE are seasons occasionally when sweet potatoes are so plentiful that sales are difficult to effect, and prices are correspondingly low. It is then that the advantage of storing the tubers for a better market comes into play. We have often heard men say that it is no use storing sweet potatoes; if they do not rot, they shrivel up and become tough. We have kept them perfectly fresh by storing them in a cool place in sand. There are two important matters to observe in putting them away. First, they must be allowed to become thoroughly ripe before digging; and, secondly, when stored the tubers must not touch each other, and air must be excluded as much as possible. How are we to know when a sweet potato is ripe? Everyone who has grown the crop knows that a milky juice exudes from a broken potato. Break one, and notice if the juice when dry is of a dark colour. If so, the potato is not ripe, and it will be labour thrown away to store them. But should the juice on being dried remain white, the tubers are ready to be taken up. But they are not yet ready to be stored away, any more than apples are ready to be packed in cases or barrels the moment they are gathered. The latter fruit wants airing by exposure; so do sweet potatoes. They should be spread out either in the field or in the barn for several days, exposed to the action of the air. This is, in fact, a kind of curing process. In storing them the proper method is to lay down a thick layer of sand, on which the first layer of tubers is placed. Then pour sand over them till they are completely covered and all the crevices filled. Next put down another layer of tubers, which will lie on the second sand bed. Pour in sand again, and so on till all are put away. The sand having excluded the air, the potatoes are safe, and will keep in ordinary weather right through the winter. Very hot weather is, however, very injurious to them, and therefore the place of storage should be as cool as possible. The main points are, as we said before, perfect ripeness and sufficient aëration or curing.

WHEAT-GROWING BY IRRIGATION AT BARCOLDINE.

MR. W. H. CAMPBELL supplies the following interesting particulars of experiments made by him in wheat-growing by irrigation with artesian water at Jacindol. These experiments go to show the excellent results which may be obtained in dry country by this means. He says:—The first experimental plot of wheat at Barcaldine was sown by Professor Shelton in July, 1895. The site chosen was two acres of the chocolate soil on the plain country. This was fenced in and planted with thirty-two different varieties of wheat under Mr. Shelton's supervision. The seed germinated, but no rain fell during the months of August and September, and the plants withered up and died. On the same spot I sowed two acres of Allora Spring Wheat in June, 1896. This germinated, but, owing to protracted dry winter and spring, it did not flourish, and ultimately it was destroyed just after coming into ear by marsupials and parrots. The same year I prepared an acre of ground adjacent to the bore stream, close to the homestead on Jacindol Grazing Farm, and this was sown with the remainder of the seed supplied by the Department of Agriculture,



WHEAT-GROWING AT BARCALDINE.



WHEAT-GROWING AT BARCALDINE.

This yielded 16 bushels of good sound wheat. This year I ploughed up fourteen acres of downs country adjacent to the bore stream. Eight acres were sown with wheat, and the remainder with oats for hay. Of the wheat area, four acres were ploughed five inches deep, and cross-ploughed, then harrowed and rolled. The other four acres were ploughed only once and harrowed once. The seed was Allora Spring Wheat, sown at the rate of 10 bushels to eight acres. Five bushels were from seed grown by me last year, and five of fresh seed supplied by the Department. I intended to sow the wheat in May, but no rain coming I postponed the sowing until 8th June, when I irrigated the field, and the seed germinated. The method of irrigation was by plough furrows from the main drain. On a portion of the field the furrows were 21 yards apart, and the surface was saturated by the overflow. On the remainder of the field the furrows were made 5 feet apart, and the ground was irrigated by soakage through the subsoil. Shortly after the seed germinated, the young plants were helped forward by a fall of over 2 inches of rain. No more artificial moisture was applied until the wheat was coming into ear, when the ground was again thoroughly saturated. The rapidity of the growth of the wheat rather astonished me, as it was quite ripe the second week in October before the hot weather set in. I kept the best of the crop for grain, reaping $5\frac{1}{2}$ acres. The remainder was cut for hay, the method of harvesting by hand reaping and threshing with a flail being too expensive. Competent labourers cannot be obtained under 30s. a week and found, and the harvesting of this small field of grain cost £2 10s. per acre. The yield was twenty-nine bags. A portion of the field measured off for the purpose yielded 25 bushels per acre, and a small portion, where an extra application of water had been tried, gave nearly 30 bushels to the acre. The cost of irrigating is trifling, provided the water is already available for other purposes. The bore on my grazing farm cost £700, but since that was put down the price of boring has decreased, so that a farmer for the expenditure of £500 in cash can have an artesian well of any depth down to 1,200 feet, cased from top to bottom, and available for immediate use. The drains are made simply with tank-plough and delver, and the irrigation furrows with ordinary plough. One man with a long-handled shovel directs the water in to the furrows until the whole field is saturated. A bore with a flow of 500,000 gallons per day should be sufficient to irrigate from 300 to 400 acres. I may mention that up to the present time no sign of rust or other disease has put in an appearance, and the only enemies to be feared are the marsupials when the crop is green and the galah parrots when the wheat is in ear. The grain is plump and heavy, and the samples I forwarded to the South were favourably commented upon by the millers. An offer was made to buy 200 bags at 4s. 6d. per bushel, delivered in Rockhampton, but, as flour is selling at £18 per ton in Barcaldine, farmers will expect a higher price than this for their wheat until the local demand is satisfied. Although labour is dear at present, horseflesh is cheap; and in ordinary seasons the working horses need no other food beyond what is supplied by the natural grasses on the Western Downs.

WHEAT-GROWING AT ROMA.

COMING from the tropics (Barcaldine being almost on the Tropic of Capricorn) to the more temperate district of Roma, some 180 miles further South, we find equally satisfactory results in wheat-growing. The centres of the industry around Roma are in the directions of north-west, west, and east of the town of Roma. A little wheat is also grown to the south of the town. Six thousand acres were under crop this season, of which 5,000 acres were harvested for grain and

1,000 acres cut for hay. Had it not been for some doubt entertained by the farmers as to a probability of rainfall, this latter area would not have been cut prematurely, and the returns of grain would have been largely increased. The variety of wheat sown was Allora Spring, and, although the returns are not yet fully made up, it is understood that the average yield will amount to 16 bushels per acre.

Amongst other successful farmers may be mentioned Mr. McPhie, who, we are informed, sowed 108 acres, from which he obtained a yield of 553 bags. A portion of the land returned over 30 bushels per acre. As is the case throughout the wheat districts, some of the grain is pinched, but, taken all round, the sample is a very good one, and should command full market prices. The farmers are holding their wheat for a rise in the market, much of it being stored in the town. The first portion of the crop sold to the local mill realised 4s. 6d. per bushel. The best is now quoted at 4s. to 4s. 3d per bushel. With flour at 35s. a bag, the farmers do not care to sell at a low figure which will yield a larger profit to the miller than to the grower. It is worthy of note that the Roma district has supplied nearly one-eighth of the total wheat production of the colony ; and there is yet a very large amount of excellent agricultural land open for selection on Bungeworgarai and Dargal Creeks, whilst in the Maranoa district there are three-quarters of a million acres open for selection as grazing and agricultural farms. It is anticipated that the scrub lands near the town of Roma will be largely selected under the new Land Act, which comes into operation on the 1st March of this year. There are many intending selectors looking round the district. One Victorian farmer stated that if such land as he saw about Roma were offered for selection in the southern colony, there would be a great rush for it.

Farmers are to some extent handicapped by the long land carriage, which much, though unavoidably, increases the cost of farming machinery. It costs £5 to get a three-furrow plough from Brisbane to Roma, whilst if there were water carriage the freight would be considerably less. For instance, the freight on the same implement from Melbourne to the Brisbane railway truck is only £1 17s. This is a disability, however, which must always hamper the Far West farmer, however much the railway authorities try to reduce the freight, and as much as possible is being done in that direction to lessen the tax on the Western man. A few words about the bore may not be uninteresting, although boring has been at present stopped. At 520 feet a flow of 4,000 gallons was obtained under a bed of blue clay. At 907 feet, passing through the same stratum of clay, the flow increased to 100,000 gallons per day. At 1,298 feet 264,000 gallons were obtained, and at 1,678 feet, when operations were suspended, the flow remained the same. The population of Roma being about 2,000, this gives an ample supply of water for domestic and house purposes.

DENTITION OF SHEEP.

A NEWLY dropped lamb is either without incisor teeth or has only two. At the end of a month it has the whole eight. They continue to grow until from fourteen to sixteen months, when the two central teeth are shed and attain their full growth with the growth of the sheep at two years old. Between two and three years the next two incisors are shed, and at three years the four central teeth are fully grown. At four years old, the sheep has six permanent teeth—*i.e.*, one year before the horse and ox ; and the sheep is then known as "full mouthed." At five years, all the teeth are fully developed.



WILTING TOBACCO.

DIRECTIONS FOR CURING HEAVY PIPE AND EXPORT TOBACCOS.

By R. S. NEVILL,
Tobacco Expert.

IN cutting tobacco, if the day be cloudy, you may cut at any time; but if the sun be shining and hot, cut only late in the afternoon. Never cut or handle tobacco when it is wet, either from dew or rain. Never cut in the afternoon more than you can take up the following morning before the sun gets hot. Never cut after a hard rain, as it washes the gum off the tobacco, but wait a few days for it to gather gum again.

The tobacco cut in the afternoon may be carefully and gently laid in piles of ten or twelve plants for convenience in hanging, unless you prefer to hang as you cut.

In hanging tobacco on the stick, *it should not be put closer than four to six inches apart*, according to size of plant. If put closer than this, you will have pole burn, and many leaves that will not cure, but dry up dead, dingy, and green. After putting the tobacco on the sticks, put it on scaffolds in the open air, and if it is thoroughly wilted—that is, leaf and stem have become perfectly limber—you may put it close together. It is best for it not to get rained on while on the scaffold. If this should happen, however, open it out until it dries off, then close it up again.

If possible, the scaffold should be placed where it will be shaded from 11 till 2 o'clock.

Let the tobacco hang on the scaffold for three, four, or five days until it yellows, but *do not* wait until it begins to cure or dry up; then remove to the barn, and hang it from 6 to 10 inches between the sticks, owing to the size of the plants, and regulate the tobacco on the sticks.

Now begins the most particular part of the whole process of making tobacco, for it is now that you must fix in the leaf all the desirable qualities that go to make a valuable product: strength, elasticity of leaf, flavour, &c. If you wish to air-cure, your barns should be so constructed that they can be made very close or very open as may be required by weather conditions.

If you desire to fire cure (and I recommend this on account of the dampness of your curing seasons, and because fire-cured tobacco will resist deteriorating influences and conditions best), you want your barns closed in with plenty of ventilation around the eaves and in the gable-ends, and at the bottom of the sides ventilation that can be closed or opened as desired, that you may be able to control and regulate it.

If you desire to cure your leaf a bright colour, artificial heat is necessary, letting the tobacco stay on the scaffold and yellow, then fixing this colour with fire, but in air-curing it usually gets darker as the cure progresses.

To cure with open fires, build small fires in pits over the floor of the barn, of slow burning woods, and keep them low and smothered, so as to produce a good deal of smoke, and keep a low temperature for the first twenty-four hours, not above 90 degrees, for a hot fire at the start will blue your tobacco. After the first twenty-four hours, raise your heat *very* gradually until by the end of forty-eight hours from the time of starting you may have it from 125 degrees to 135 degrees. After that, you may safely go to 160 degrees or 170 degrees. Keep careful watch of fire, night and day, until the leaf and about half or two-thirds of the midrib or stem are cured, and then draw your fires, and allow the barn to cool. In a few days (from the sap left in the stalk and stem) you will find your tobacco has become soft, and the colours that were irregular before have run into each other, and formed a solid colour over the leaf. When this has taken place, then again build your fires, and continue them until the stem and stalk are entirely cured, when you

will not need to fire more, unless there should be a continued rainy spell and your tobacco gets very soft, when a little fire to dry out the barn will do good.

While firing, watch the tobacco very closely, and see if at any time it begins to sweat, which will show itself by the tobacco getting wettish. If this should happen there is then danger of pole burn, and you should open the ventilators around the bottom of the barn, and get up a free circulation of air; and when the sweating ceases, close the ventilators and proceed with your firing.

If you prefer to air-cure your tobacco, then, as before stated, your barn should be so constructed as to be very close or very open, as the season may require, and always with plenty of ventilation at top, that hot air may get out of the roof.

After scaffolding, hang in your barn as heretofore directed. In cool, pleasant weather, and at night, keep your barn open to the fullest. In very hot weather, especially when winds are blowing, or in foggy weather, keep your barn closed.

If the weather be showery, with intervals of sunshine, you may keep them open; but if the weather be continuously wet and muggy, close them; and if you find your tobacco getting very soft, with a tendency to mould, build a little fire to dry out the barn.

The idea in curing by air is to keep the tobacco curing uniformly all the time, neither too fast nor too slow; and the opening and closing the barn must be regulated with that idea.

In curing tobacco with fire, the tips of the tobacco leaves should never be nearer the fire than 5 feet.

Tobacco is ripe when it grains up, and shows brown spots on the leaf, and shows a rough surface, and is very brittle, breaking readily when doubled up.

It should never be allowed to stand until the points of the leaf begin to dry up, for then it is beginning to lose weight, and is too far gone to make a good cure.

At all times be careful not to get your tobacco dirty, for dirty tobacco has no value.

Be careful in handling not to bruise the leaves, for bruised tobacco will not cure properly. Good tobacco can only be made by good curing, and good curing can come only by painstaking and experience, and close observation. It is a profitable crop if well done, and, like all other things, if you do not try to do it well, had as well be left alone.*

* NOTE.—The above directions for curing will not do for cigar tobacco.

NOTES ON SILOS AND SILAGE.

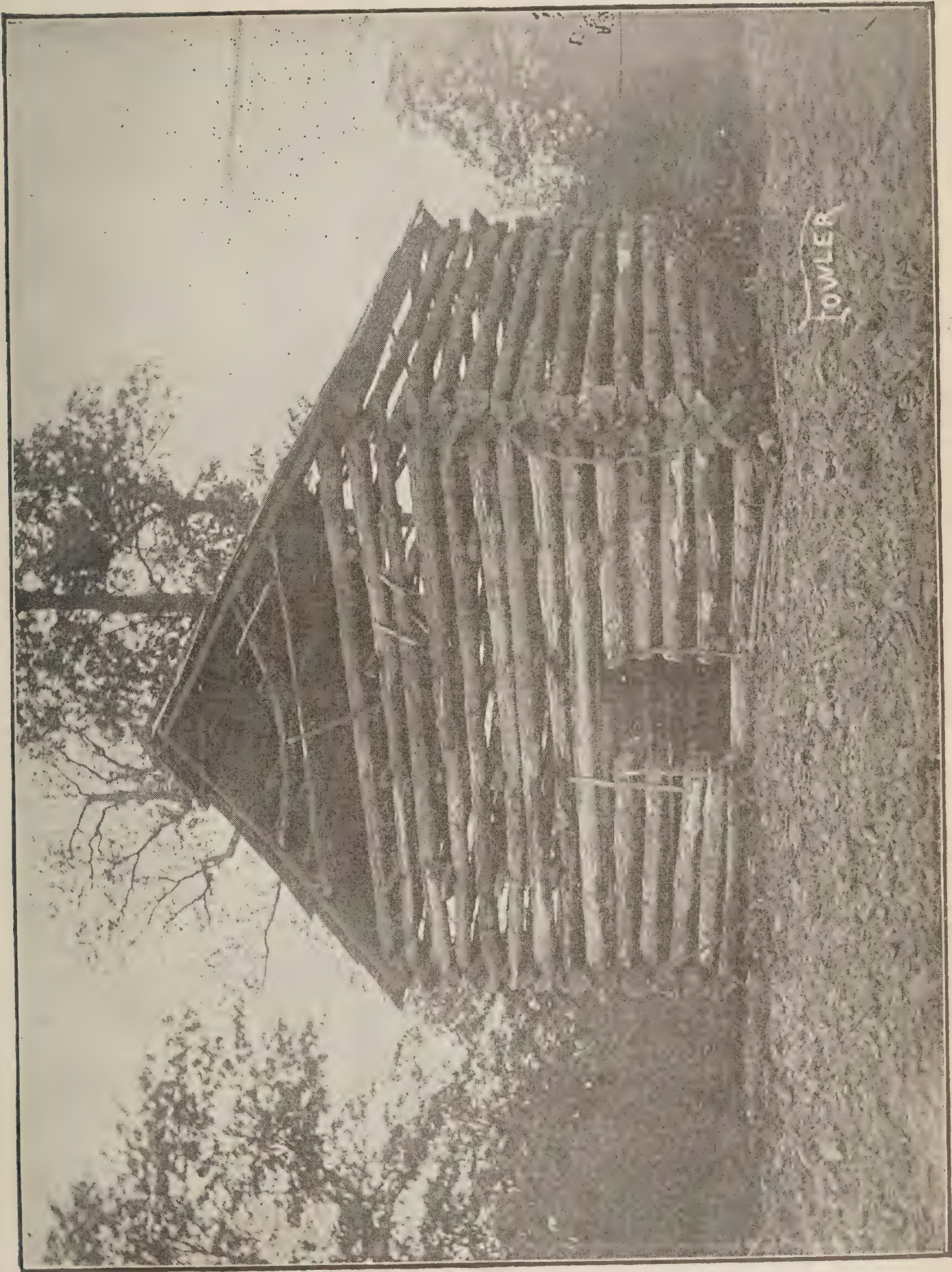
In storing a portion of the coarse feed for farm animals, the silo has many advantages over the ordinary methods. Fresh green herbage is the natural and best rough feed for cattle, sheep, and horses. Silage comes closer to this feed than any other.

Silage deteriorates very slowly with age, if at all, and may be fed when several years old.

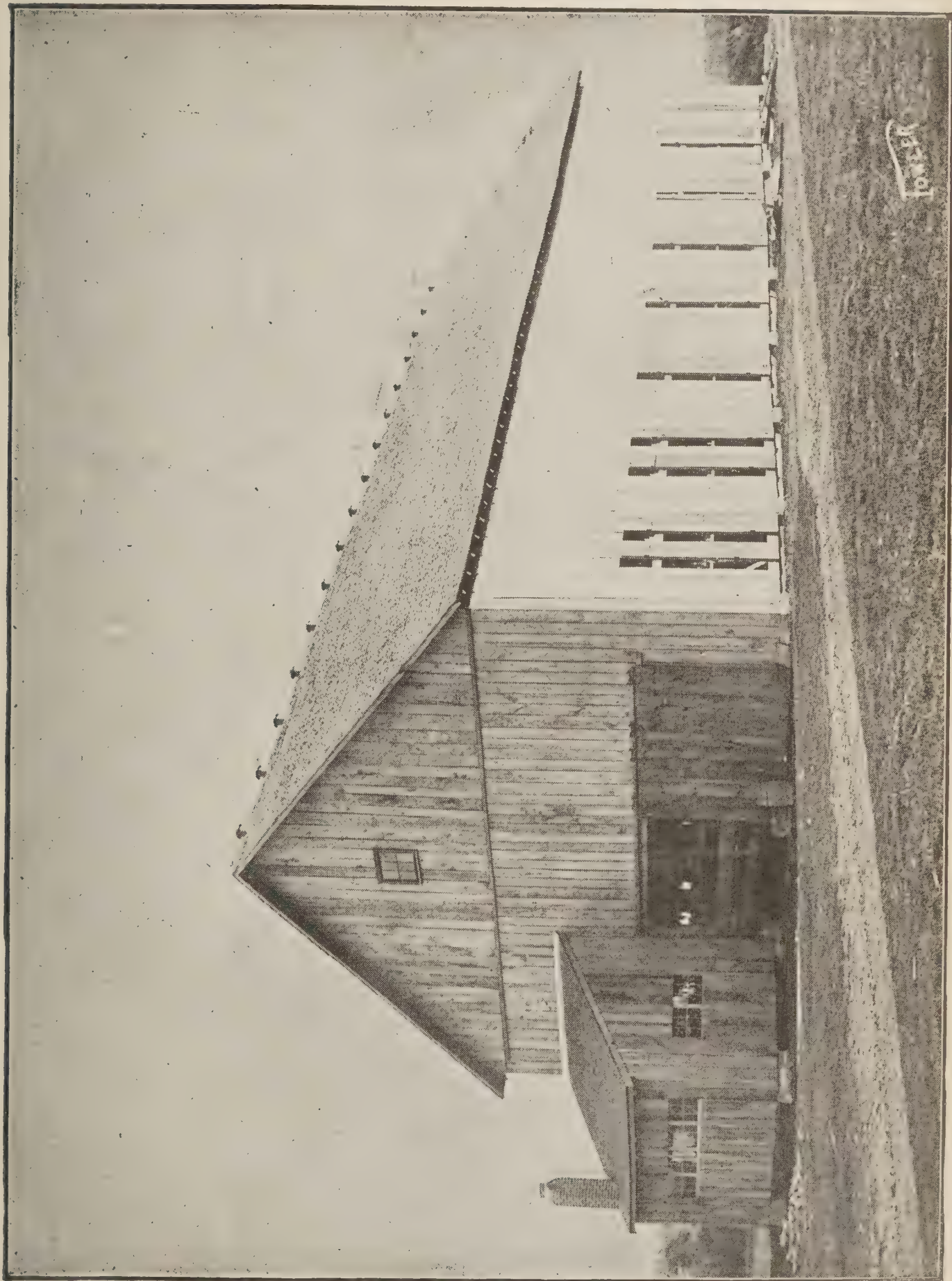
The storage required for silage per ton of dry matter is only about one-third that required for hay.

A silo makes it possible to keep a larger number of cows on a given area of land than is possible in any other way where rough food is not purchased.

To ensure the best silage and the least loss of dry matter, it is important that the silage should have a depth at the close of filling of not less than 24 feet, and 30 feet is better than 24. A perfect silo is one which is absolutely air-tight, yet well ventilated.



CURING-SHED. OLD STYLE.



CURING-SHED. MODERN STYLE.

The first thing to do after the silo is filled is to see that its surface is trampled very thoroughly every two or three days for a period of at least ten days. Either the covering material or the silage itself should receive a thorough wetting with water at the rate of 15 to 20 lb. per square foot of surface.

The object of the water is to restore that which is lost by evaporation due to heating, and to develop quickly a thin, well-rotted, very wet layer on the surface, which then becomes a nearly air-tight cover for the silage. The weight of corn silage increases with the depth below the surface, with the amount of water in the silage, and with the diameter of the silo. At a depth of 1 foot a cubic foot of silage weighs 18·7 lb.; at 3 feet, 22·1 lb.; at 5 feet, 25·4 lb.; at 7 feet, 28·5 lb.; at 9 feet, 31·6 lb.; at 12 feet, 35·9 lb.; at 15 feet, 40 lb.; at 24 feet, 50 lb.; at 35 feet, 60 lb.

The capacities of silos increase more rapidly than do their depths, so much so that a silo 36 feet deep will contain nearly five times as much silage as one only one-third that depth.

Doubling the diameter of the round silo increases its capacity a little more than four times, while trebling its diameter increases its capacity nine times.

Silage spoils more rapidly when fed from the sides than when fed from the top. Slight traces of mould have been observed in silage, when being fed at the rate of 1·2 inches per day, and this would indicate that it should not be fed slower than this daily. Each 2 inches of corn silage will weigh, on an average, 7·5 lb., and on this basis the proper surface area would be placed at 5 square feet per cow or her equivalent.

Where the feeding areas are small enough to allow the surface to be lowered 2 or more inches each day, and assuming 40 lb. to be fed to each cow daily, then a silo 30 feet deep, round, and with a diameter of 15 feet will contain 108 tons of silage, and will feed thirty cows for 180 days. Increase the diameter to 20 feet, the contained silage weighing 216 tons will feed sixty cows for the same period, whilst with a diameter of 26 feet the content of silage will be 360 tons, sufficient to feed 100 cows for 180 days. If the silo has square sides, the dimensions for thirty cows will be 12 × 14 feet, for sixty cows 18 × 18 feet, and for 100 cows 24 × 24 feet.

It is possible to avoid all surface loss by arranging the feeding of the silage and the filling of the silo. To do this a silo would be built which would hold feed enough to carry the stock from 1st October* until the first crop of clover is ready to cut for hay and silage. At this time the silo may be empty, and then enough clover silage should be made to last until either a second crop of clover or corn is ready to cut. With this plan there would be no time when silage is not being used, and no time for surface loss, while the two fillings allow a smaller silo to answer the purpose.

The silo should be placed where it is most convenient to feed from, and to fill. The best place is in the barn, where the silage is to be fed.

Various criticisms are urged against silage, and particularly against the building of silos in a barn where cows are kept.

As a result of a series of observations made by the writer of these notes (Professor F. H. King, Physicist to the Agricultural Experiment Station, University of Wisconsin, United States of America), it was demonstrated beyond question that, when silage is fed a short time before milking, a sweetish odour is imparted to milk, by which it may be detected from milk not produced from silage. It was further demonstrated that if the silage is fed to cows just after milking, in the majority of cases, milk so produced could not be separated by the sense of smell from non-silage milks.

The reason for these differences is plain. Whenever a cow eats any substance containing a volatile principle which is not digested . . . then this will be removed from the blood through the various channels of excretion.

* In the United States—April in Queensland.

This being true, if the cow is being milked at the time these products are circulating in the blood, a portion of them will be removed in the milk, and will impart a flavour or odour to it. On the other hand, if sufficient time intervenes between feeding and milking, then such products will have been removed from the blood by the skin, lungs, and kidneys; the milk is drawn without the odour, or with its intensity greatly reduced. The dairyman then has it in his power to strengthen or to weaken certain flavours or odours in his milk and butter by both the kind and the time of feeding. A higher score was given by Chicago experts to silage butter in point of flavour.

Professor King, in conjunction with Professor E. H. Farrington, Instructor in Dairy Husbandry at the Wisconsin University Experiment Station, conducted a series of experiments to prove whether silage odours in the air about the milk will impart a perceptible flavour or acidity to it.

The milk was placed where the strongest effects could be obtained. Thus a quantity of sweet milk from the creamery having the temperature of the air was divided into two lots, and one portion placed in an open milk-pail setting inside one a little larger, and then placed inside the silo, where it was allowed to set upon the silage for one hour. This milk was then placed in a series of numbered cans, with others like them containing the same kind of milk which had not been in the silo. These milks, 120 in number, were then examined and classified by persons familiar with the sweetish odour given to milk by silage, with the result that, out of 120 judgments by experienced judges when silage odour was definitely to be sought for, there were thirteen incorrect judgments.

To make the test still more decisive, two lots of the same milk were taken to the silo, and one was placed under the conditions described; the other had the air from the silo driven into and through the milk during one hour, and then both were placed in cans and submitted to the expert observers to be classified as having or not having the sweetish smell in question. In seven cases out of twenty-four there was a mistaken judgment, and it was agreed that the odours taken up by these milks were much less pronounced than is found in milks produced where silage is fed just before milking.

To ascertain if the silage odours could have an effect on the acidity of the milk, a quantity of sweet milk was divided into two lots, and one portion placed in a 2-gallon bottle and taken to the silo where, with a small hand-bellows, the amount of air it would hold was forced through the milk 1,000 times. The milk and its reserved portion were then tested as to their acidity; and to the surprise of the observers the milk aerated in the silo indicated the least acidity. Thus it is shown that silage air does not measurably increase the acidity of milk. It also appears that silage odours enter milk more rapidly through the cow than from the air.

The best corn silage and the smallest necessary loss occur when the silage is made from well-matured, well-eared corn. Such corn, with leaves still green, is in the proper stage for the silo.

The silo should be filled slowly, the time extending over fifteen days, giving time for the silage to settle and to expel the entangled air, by setting free carbonic acid, and thus ensuring small losses and sweet silage.

The smaller varieties of corn are the best for silage.

Corn may be put in the silo either whole or cut, but more care and time are required with whole corn than if it is run through the cutter first; and it is certain that more time will be required to take the silage out of the silo if put in whole.

As methods of farming become more and more intensive, farmers will come to use silage as a part ration during the whole year. The silo must ultimately supplant the pasture, except as a place for airing and exercise, and no method of soiling can prove as economical as the silo when properly constructed and handled.—*Bulletin of the Agricultural Experiment Farm, Wisconsin University, U.S.*

ON CROSS-BREEDING.

BY P. R. GORDON,
Chief Inspector of Stock.

SEVERAL meanings have been attached to the term "cross-breeding." It has been used in connection with the mating together of different types or varieties of the same great family, such, for instance, as the American with the Australian merino. In this sense it is used in contra-distinction to "breeding in the line" or consanguinity, and this form of breeding together of two types of the same breed is known among practical breeders as breeding for an "outcross." The meaning, however, generally attached to the term is the coupling of the male of one distinct breed with the female of another distinct breed, or *vice versa*, as, for instance, a Shorthorn with a Hereford, or an English coarse-woolled sheep with a merino, a thoroughbred with a draught horse, &c.; and it is in this latter sense that the term is here used. Cross-breeding has been practised with two distinct objects in view. First, for the production of a superior class of beef or mutton; and, second, with the intended object of establishing a new permanent variety midway, or at some point, between two breeds. The former requires very little skill on the part of the breeder beyond care in the selection of the animals to be crossed. It is the case that the first cross between two distinct breeds, particularly in cattle, results in the production of a superior beast for the butcher. There are breeds that can be crossed with greater certainty of success than others; as, for instance, the Shorthorn on the Aberdeen-Angus or Galloway, the reason being obvious—namely, the preponderance of fat in the Shorthorn and the compactness of flesh of the two latter breeds; but as a general rule the qualities of each breed blend pretty equally in a first cross between any two different, old-established breeds of cattle. To proceed beyond a first cross is to court a certain amount of risk and uncertainty as to the character of the progeny, for here the prepotency of the line of one or other of the parents will dominate, and the best and most experienced of breeders cannot forecast the result with even an approach to certainty; but when a second cross, or "grade" as the Americans term it, has been decided upon, only a pure sire should be used, and, if the sire is of the same breed as the sire previously used, the produce is termed in bush phraseology a "come back." There are many instances in which the use of a pure sire of a breed with a female of very mixed ancestry has resulted in excellent butchers' beasts; but in such cases the many instances of failure frequently overbalance the successes. Those who undertake the formation of a new breed by the blending together of two distinct varieties, such as the merino and cross-woolled sheep, or say the Shorthorn and Hereford breed of cattle, must not look for success until after long years of patient observation and the careful weeding-out of all inferior animals from the flock or herd. In order to understand the difficulties they will have to contend with, it will be convenient to represent the breeds to be blended by figures. Taking a maximum of 100 to a minimum of 0 to represent the hereditary strength of the parents, and using for the first three crossings a pure sire, say Hereford, on Shorthorn cow, the male will be found in all his hereditary strength, while heredity or constancy will after the first cross be weakened and ultimately destroyed in the female. The case would stand thus: $\frac{100}{2} = 50$ for the first cross; that is, the progeny would represent equal parts of each breed. The second cross—pure Hereford sire on first cross dam—would represent $\frac{100 + 50}{2} = 75$ of the male and 25 of the female. The third cross would be represented by $\frac{100 + 75}{2} = 87.5$, or seven-eighths Hereford to one-eighth Shorthorn. Having arrived at this grade, we

will suppose the breeder now resolves to fix it by using only bulls of this grade. It will be understood that in that case the herd will never approach nearer purity of Hereford blood than seven-eighths, even although the breed may be continued up to 100 generations. But what the breeder has now to contend with is Atavism, or what horsebreeders term "harking back" to some distant ancestors. This tendency is always strong in even pure pedigreed animals, but doubly or trebly so in mixed breeds. Of the successive progenies, it will probably be found that one-third or even one-half will show a tendency to reversion to the Shorthorn, the remainder to Hereford ancestry, for the reason that the prepotency has been weakened on both sire and dam. The breeder cannot attain an undeviating result, even with the closest culling out, until after the lapse of many years. While this difficulty is met with in all efforts at establishing a new variety of cattle, it will be found to be greatly increased in attempts at establishing a permanent variety of sheep founded on a cross between the merino and any coarse-woolled breed, for the reason that the breeder has the question of wool to take into consideration in addition to carcass. For that reason, there is not the same uniformity of success in a first cross between the merino and any given coarse-woolled breed as there is with a first cross in cattle; and even when the cross is between two types of the same breed, such as that of the American and Australian merino, cited above, the same law prevails, although in a less degree. The prepotency may, and in all probability will, be unfairly represented, and for several generations the breeder will have to contend with the tendency to reversion, which will seriously disturb the establishment of a fixed type, and necessitate the most close and careful culling.

Dairying.

FARMING AND DAIRYING IN QUEENSLAND.

[Read before Logan Farmers' Industrial Association, in the School of Arts at Beenleigh, 28th January, 1898.]

By JOHN MAHON,
Dairy Instructor.

HAVING been occupied nearly the whole of my life in agriculture, dairying, mixed farming, and cattle-breeding, I should be able to speak with some authority on the topics of general farming; at the same time it would be bold on my part if I were to claim perfection in one single branch of the above-mentioned industries.

That greater progress has been made in every branch of agriculture during the last twenty years than had been made during the past century must be apparent to all observant persons. Progress is a law of Nature, and as each year passes by we shall become more enlightened, and will continue to become so until the end of time.

The person who considers that he has reached the top of the ladder of perfection is unwise, and will surely and quickly fall. The most successful men in this age of progress are those who mix a little brains and common sense with their daily toils. The man who is content to go on in the footsteps of our forefathers in a haphazard plodding manner, as a rule, is as far advanced at the end of the year as he was in the beginning. Such men are usually found to be bush politicians, who find fault with everybody and everything, and are always crying out for State assistance. In my opinion, if such a class of men were to place more confidence in themselves, and devote more attention to their own business, they would be far more successful.

The cry of many outsiders who visit this colony periodically, and by some who reside here permanently, that we have no practical farmers in Queensland, is all bosh, and I should like very much to see some of these critics placed side by side on the land with men who have been farming here for the last thirty years, and who have had many difficulties to contend against. Then I am quite sure the fault-finders would have but a poor show of being as successful as the practical Queensland farmer. Of course it must be remembered and regretted that these practical farmers do not constitute the majority. I am also confident that a man must live here for a season or two before he becomes acquainted with our climate and soils.

During my travels through this colony I have seen some very good farmers, who, I am sure, could hold their own even in countries where perfection in agriculture is claimed. I have also seen some very lazy, careless ones, who were never intended for the land, and need never hope to be successful. Such men are generally found to be faddists or theorists, and can relate from theory what has been done in other countries, where the conditions are quite different to those of our own colony.

I maintain that there is no knowledge so valuable as that gained from practical experience, especially in this colony, where growth is so rapid.

The vast improvement in the methods of agriculture and dairying compels a man who would succeed to keep pace with the times. Old ideas must be cast out to make room for new ones—modern and labour-saving appliances must take the place of the obsolete.

Settle the people on the land is the prevailing cry of our legislators, and all who have the welfare of the colony at heart; which, no doubt, is essential to bring prosperity to such a prolific agricultural colony as this. But, in my

opinion, there is a class of undesirable settlers: such as those who have no knowledge of tilling the land, who allow the Chinaman to take away the manure, who buy their vegetables from the Chinaman, and produce nothing from the land to supply their household, and also secure a larger scope of land than their means will warrant. This class of settlers is, in my opinion, undesirable, and they only occupy the place of men who would be an acquisition to the colony and a benefit to the State. There is another matter which appears to me to be one that will, sooner or later, militate against successful agriculture—*i.e.*, the small area of land offered to intending settlers. My contention is that no man with a family can make a decent living on from 70 to 80 acres of land, there being no scope for the farmer to extend beyond a small limit. Mistakes are also made by men going on the land without any capital. Doing so means that the man will have a long struggle before he gets his head above water, especially as there is bound to be keen competition among agriculturists, and the man who is not in a position to get up his goods in the best marketable condition will have to be content with low prices.

The great future that awaits Queensland in the dairying and agricultural industries is beyond the expectation of the most sanguine person. There is no denying the fact that no colony in Australasia, and perhaps no country in the world, affords the same facilities for any branch of farm life as Queensland does at the present day. We have sufficient excellent agricultural land to carry millions of people, 75 per cent. of which is practically unutilised to any remunerative extent, other than sheepwalks, and can be purchased at prices which I consider a gift. This is not only my opinion, but also that of practical southern farmers who would never have visited this colony had it not been for my inducing them to do so; and, needless to say, some of these farmers have disposed of their southern homes, and are now permanent residents of Queensland; others, again, are endeavouring to sell their holdings with the view of settling here.

This colony has always borne a bad name in the southern parts of Australia, and especially as regards climate, which is considered by some, who really know nothing about it, to be only suitable for the habitation of the aboriginal. However, now that we have some of these settlers amongst us, who are delighted with their agreeable change from exorbitant prices and high rents for lands, and also a climate that surpasses that of the south, being cooler and more congenial in every way, I feel satisfied that many others will follow.

One gentleman, a friend of mine, after inspecting a small area of Queensland lands, remarked that he would return to Victoria and dispose of his property without making known to his neighbours the facilities afforded settlers in this colony or his intention of coming to reside here, for he said: "Were I to do so, every farmer in my district would want to sell out and come too, and the result would be that I could not sell my property at the usual high prices." This same person further stated that the quality of the land that is being sold here for from £2 10s. to £3 per acre is equal to lands that are being sold in Victoria at £30 per acre, and, knowing Victoria as I do, I am quite sure the above statement is not an exaggeration. These facts lead me to believe that there will be a great rush for agricultural lands in this colony in the near future.

This season's wheat yield will average over 17 bushels to the acre, while the South Australian yield will not exceed 6 bushels, New South Wales about 10, and Victoria something under, which proves beyond all doubt that Queensland is suitable for other than grazing purposes, notwithstanding the opinion of some old identities up to within a few years ago.

It may be considered bold on my part in stating that the day is not far distant when Queensland will be the premier Australian colony in the output of farm and dairy produce, but I am confident that older men than myself will live to see this come to pass.

The following statistics will prove that the Queensland farmers have to produce a great deal more from the land before supplying the world's markets:—

STATEMENT showing the REQUIREMENTS of QUEENSLAND for certain CROPS, &c., and the VALUE sent out of the COLONY to provide the same.

Article.		Rate at which Production Valued.	Imports Valued at	Production Valued at	Exports Valued at	Requirements Valued at	Sum sent out of Queensland to Supply Wants.
			£	£	£	£	£
Onions	cwt.	10s. 8d.	21,905	1,040	36	22,909	21,869
Cheese	lb.	6d.	1,820	4,803	205	6,418	1,615
Condensed Milk	"		26,494	...	694	25,800	25,800
Butter	"	10d.	43,075	256,843	618	299,300	42,457
Bacon	"	6d.	305	83,478	4,385	79,498	
Ham	"	10d.	910	69,565	3,517	64,958	
Potatoes	ton	£6 10s.	14,449	119,931	283	134,097	14,166
Wheat	bush.	3s. 9d.	550,375	112,735	804	662,306	549,561
Barley	"	4s.	3,474	3,868	...	7,342	3,474
Oats	"	3s. 11d.	11,556	5,802	...	17,358	11,556
Hay {	Wheaten	ton	£3				
	Oaten	"	£3 10s.	3,826	165,677	125	169,503
	Barley	"	£1 10s.				3,701
	Lucerne	"	£2				
	Panicum	"	£2				
Total money value sent out of Queensland that should be retained							£664,199

Compiled from the Statistics for 1896.

From the above figures it may be observed that we are sending out of this colony a sum of £664,199 yearly (or at least we did so in 1896) for products that we can produce more remuneratively and of greater excellence than can be produced elsewhere. Although we are importing very largely, especially wheat, butter, and condensed milk, I think it is wise to keep on gradually opening up a trade in the world's market, which will prevent industries exploding when we have an over-production here.

FARMING IN QUEENSLAND.

Until within the last few years, farming in this colony (with few exceptions) was carried out in a very slipshod manner. The farmer arose late in the morning, got into his clothes as if afraid of hurting them, and reached the field when the best part of the day had passed; and on reaching the field, the harness that had been left there from the previous day (or may be for weeks) was usually attached to four or six horses, a number not unusually to be seen working a single-furrow plough. In some instances I have seen these horses completely exhausted with less than half a day's work, whereas two well-fed horses could do the work all day without the slightest exertion. Men who carry on farming under such conditions can never hope to be successful, and it is much to be regretted that there are numerous cases similar to those mentioned. Others, again, are content with ploughing a large area in a short period, or what is usually called a big day's work, regardless of skill or the necessity of making a good seed bed or ploughing in such a manner as to destroy the weeds or noxious growths, which, when properly ploughed in, are prevented from growing again, and which when decayed act as a good fertiliser. A great deal of good seed is wasted by being planted in badly cultivated lands. My experience of farming is such as to convince me that the man who understands his business and cultivates his land thoroughly is rewarded tenfold. It is a great mistake for a person to imagine that the only knowledge required in farming is to be able to drive a pair of horses and hold the plough on the ground. This erroneous idea has led many to ruin, and will lead many more in the same direction.

The most successful men at the present day are those who have not got all their eggs in one basket. Mixed farming is the foundation of success, and I have never known a practical man who adhered to this method fail, always having something to sell. Many farmers have grown maize continually—in fact, the business has formed part of their nature; but the time is now at hand when the production of many other crops that the soil may be adapted to grow must be entered upon. The man who adheres to maize-growing alone cannot succeed.

Dairying, pig-rearing, poultry-breeding, vegetable-growing, and even fattening a few crossbred sheep, when holding a farm of a fair size, are very profitable undertakings. Sheep, if changed from various small paddocks, will eat the rank vegetation and at the same time manure the land.

The careful and successful farmer is always producing anything and everything that there is a profit to be made from, and also in co-operating with his neighbours and sharing his knowledge, knowing as he does that it is by an exchange of ideas and co-operation with each other that every farmer at the present day must look to to further his interests in this life. The farmer should always grow such crops as his soil is best adapted to produce. Always avoid growing crops or producing stock that are a drug in the market. The man who possesses energy and skill combined, will quickly reach the top of the ladder of prosperity.

Never keep an animal on the farm that will not give you a reward for what it eats. In all cases avoid the "scrubber" cow, horse, pig, or any other such animal. The man who keeps inferior stock will be poor all his life, and will always be dissatisfied with his returns. Better keep one good animal than three bad ones; too great an impetus cannot be given to this all-important matter. The man who is not a judge of stock should quickly learn, and employ a person to do his buying until such time as he becomes competent himself.

In speaking on agriculture, perhaps I have been trespassing on forbidden grounds, especially as we have Professor Shelton, at the Agricultural College, and Mr. Benson, Director of State Farms, whose duties include the imparting such knowledge. However, the Professor's time is fully occupied at the College, as is also Mr. Benson's in connection with the fruit business; consequently, my exceeding my duty as Instructor in Dairying is, I think, quite pardonable.

THE DAIRYING INDUSTRY.

The phenomenal progress made in this industry during the last few years reflects very great credit on those who are engaged in the business.

Not many years ago the majority of the butter supplied to the Brisbane markets by our dairymen was made in a very primitive fashion, the spoon and basin taking the place of the churn, and the pan system of cream-raising was carried out in every dairy, if I may use the word "dairy"; for, at the time I refer to, there were hardly any buildings worthy of the name to be found in any part of the colony. To-day we have cream separators, refrigerators, and all the most elaborate appliances that money can procure; tons of butter are being turned out in a few hours—results which, under the old obsolete methods, would be almost impossible to accomplish, even at 50 per cent. greater cost, and, when manufactured, the butter would be totally unfit for export owing to the want of uniformity in quality.

These reforms are evidence of the great energy displayed by the so-called slow Queenslander. I am also in a position to be able to state that some of the factories and creameries that are to be seen in this colony are equal to the best to be seen in any part of Australia, which is evidence of our not being so far behind the times as some people imagine, and that we have fully realised the importance of the industry. I am confident we are not going to lag behind our southern neighbours, who have had about twenty-five years' start of us. We have been greatly handicapped here by many intelligent men entertaining an

erroneous idea that our climate is unsuitable for the production of an article of sufficient excellence for the London market, but, thank goodness, this idea was exploded long ago; and since the first shipment of butter to London in 1893, farmers have given marked attention to every branch of the industry. Unfortunately, owing to the ravages of ticks in the Northern parts of the colony, progress has been confined to the Southern parts alone. However, after four years' experience in the North, I see no reason why the industry should not be developed there. The facilities for shipping from the North are equally as advantageous as those of this part of Queensland; and all that is needed to bring the business to a successful issue in North Queensland is a proper system of aëration of milk, and the aid of refrigerating appliances to carry out the manufacturing. If such methods were adhered to, I see no reason why Northern and Central Queensland should not become large exporters of dairy produce.

Granting that a great deal of progress has been made of late, it must not be forgotten that there still remains a great deal more to be done, not only in the improvement and feeding of dairy stock, but also in the treatment and handling of milk and cream and transit by rail and by water. If every precaution be exercised by those producing the raw material, and the article becomes impaired for the want of proper accommodation during transit, the special attention given in one direction is all lost.

If the farmers of this colony were to assist each other by the aid of co-operation, they would be far more successful. The producers are the people who deserve consideration, and, if solidly united, their reasonable demands would surely be complied with. In Denmark, at the present time, there are over 1,000 co-operative dairies and farmers' associations, and the Danes rightly maintain that large co-operative bodies reduce the cost of manufacturing very considerably. Co-operation also offers greater inducement to the farmers to exercise more care in handling the raw material. I am quite confident that it is only a matter of time until actual necessity will compel the farmers to co-operate, and ship their own goods without the aid of outside capitalists.

A great deal of State assistance has been rendered the industry of late, but it must be remembered that we are not exporting bounty-fed butter as some people imagine. The assistance given to dairy factories, and the bonus paid on butter exported, does not come out of the pockets of the general taxpayer. Quite the contrary. Under the provisions of "*The Meat and Dairy Encouragement Acts, 1893 to 1894*," the dairymen are taxed to subscribe a fund for the encouragement of the exportation of dairy produce. This tax amounts to 15s. for every 100 head of dairy cattle, with 10 per cent. added from the meat fund. Consequently it is actually the milk-producers who are called upon to pay the bonus and subsidies on all factories built under the Act. Under the above Act, up to the present time £3,232 17s. 4d. has been paid away in bonuses on butter exported, and £6,389 15s. 1d. towards subsidising factories. One co-operative factory only participated in the bonus. Of course the subsidy on buildings and appliances is only lent, and will in due time be collected with interest added.

Although the dairymen were called upon and subscribed the money under this Act, I am sure good results have accrued therefrom, especially in opening up an export trade, and in assisting men of small means.

In my opinion, there is a matter that is of greater importance to the farmers of this colony than a dairy produce bonus, and one which demands the immediate consideration of our legislators, and that is an establishment of a depôt in London, whereby a thorough system of distribution of Queensland products could be carried out. At the present time, we are actually in the hands of traders, who, as every person knows, invest their capital with the view of obtaining big dividends. Place anyone of us in the same position, and I am quite sure we should do likewise.

The reputation of the Danish butter is not so much due to the excellence of its quality as to the energy shown by the Danes in making a name for their goods in the English markets. Years ago the Danes opened up depôts in the various centres in London and elsewhere, which were placed in charge of Danish dairymaids, who retailed the article until it gained the name that it holds at the present day. It has also been stated that Australian butter had been placed in Danish boxes, and sold as choicest Danish, and I have every reason to believe the statement to be true. I ask, Would the Danes allow the Australians to sell their butter as best Danish? I doubt if they would tolerate such a thing. This should be an object lesson for the Queenslanders. To further substantiate my contention, that Government supervision (for a time at least) over the distribution of our produce in the London market is necessary, I will reproduce a splendid article on Australian produce in the London market, which was compiled by Mr. J. P. Dowling, editor of the *Sydney Mail*, and read at a conference of dairymen held at the Hawkesbury Agricultural College, New South Wales, last year:—

“MARKETING OF AUSTRALIAN PRODUCE IN ENGLAND AND OTHER COUNTRIES.

“By J. P. DOWLING.

“Mr. Chairman and Gentlemen—better term, perhaps, ‘Fellow-workers,’—I address you to-day under disadvantages which I shall briefly explain. When I was honoured some weeks ago by the request that I should read a paper to you, and willingly assented, I did not know that a series of unexpected conditions would render the careful preparation of a paper almost impossible. Such, however, has been my experience, and consequently what I give you to-day are merely a few jottings very roughly put together.

“I speak as a friend to very old friends; but old as we are in friendship I must confess that I never address a number of practical men about the business in which they are engaged without experiencing much nervousness. You dairy farmers are so often lectured about bacteria and the evil effects of not knowing how to suck eggs properly, that I fear you will take it that I am about to inflict upon you a weighty learned discourse, with extracts from many books and trite ideas dressed up like old dolls in new clothes. Let me assure you that I will not do anything of that kind. What follows will be as plain an exposition as I can give of some practical experience which cost my employers many hundreds of pounds sterling. They sent me to Britain in 1895 as a perfectly free journalist to obtain answers to a few questions, the chief of which was: What was the matter with Australian produce in British markets? Gentlemen, I have in a hundred ways, during the last eighteen months, answered this and other questions in the columns of the newspaper on which I am employed, but never once have I spoken publicly on the subject of the butter trade. I remember that I addressed a meeting in the Sydney Exchange on the meat export question. A paper of mine was read before the Society of Arts in London; but so pressing were my ordinary business engagements, that never until now could I spare the time to have a chat with my well-respected old friends, the dairy farmers. I call you old friends, because far back as twenty years ago I joined with you, heart, hand, and pen, to bring about certain local reforms. That was in the days when butter factories and butter-making machinery were only in their infantile stages, and now, when dairying has reached a much higher level and has immense quantities of butter to export, I step in just as I did of old, and with the same expression, ‘I am here to help.’

“As it is my desire not to be misunderstood by any of my hearers or readers, it is necessary to preface this—which will indeed be a very plain, unvarnished chat—with the statement that I do not regard all men as either rogues or fools. A life of fair length and opportunities greater than those which fall to the lot of ordinary men enable me to say that the proportion of

roguery or folly in men is but small. But remember that proportion is always there. The trader of to-day is just as apt to do—what shall I say?—well, strange things as he was twenty years ago. He does the best he can for himself, and sometimes outsteps the bounds of common honesty so that he may make large profits. Now, gentlemen, what was your experience twenty years ago? The greater part, in fact nearly all, the dairying of this colony was done within sixty miles of Sydney. A voyage of a few hours sufficed to bring your butter to the stores of agents or to the middlemen, and, although those middlemen were almost not more than an arm's length from you, I found you grumbling, and not without cause. The Sydney market was almost as fickle and subject to extraordinary changes as the London one is now. Your butter never made a rise or fall less in extent than 3d. per lb., and I think we proved that the middlemen who stood between you and the consumer got almost as much out of every pound of butter sold to the consumer as you realised. That is, you, who had the farm and the cows, and supplied the labour from the pasture to the time the butter was placed on the wharf for shipment, received no more for your pains than did the men whose duty consisted of distributing that butter in Sydney. Well, by one great worthy co-operative movement you reformed the Sydney trade; but even now, speaking locally, all is not perfect. You find that you have to keep a constant watch on the middlemen. And, gentlemen, let me say right here that the middlemen of Sydney are as honest a class as any traders in the world.

“But now we are led right to the spot from which our subject starts, and are faced with the question: Should you expect the middlemen of London, 12,000 miles away, to be honester or more trustworthy than the middlemen who are within sixty miles or a few miles more of your home? Is human nature changed? Are the London agents of to-day more reliable men than your acquaintances of Sussex street with whom you dealt twenty years ago? Well, gentlemen, I have been in both places, and I can candidly assure you that there is no change. The men of Tooley street and of Smithfield, London, so closely resemble in form, features, and action the men of Sussex street, Sydney, that if the two were mixed I could not pick out the Sydney ones. Remember they are men, not angels—at least, not yet angels. Their wings may be sprouting, but, until they are full-fledged and have their halos, don't expect them to be more than ordinary folk. Some of you farmers do not object to take a point when you get the chance. Our financial men, our company people, need auditors, and the honester the trader is the less he objects to the exercise of certain safeguards. The man who has true weights never feels aggrieved when the inspector of weights and measures comes round. Even you, my friends, who have clean dairies and healthy cows feel no displeasure when the inspector of nuisances is about, because you know, as I do, that certain forms of supervision are in all kinds of business or all grades of life actually necessary.

“Let us accept this as the rule, and I will ask you are we to make the exception in favour of the men who are called upon to sell your produce in countries thousands of miles away?

“You see that by what I hope were easy grades I have led you right into the middle of my subject, and you should fairly ask me what are the markets of Britain like, and what are the prospects of Australian produce in those far-away markets? Had you asked me two years ago, I could have given you a very different version to what you shall hear to-day. I would have told you of the great possibilities, and that all which was necessary was to send to London butter of the first quality, and you would in return receive the top price less a fair percentage deducted for expenses and commission. I now have to tell you that unless you exercise such care and watchfulness as do other exporters, such as the Danes, French, Germans, Canadians, and Americans, the mere fact that your produce bears the brand ‘Australian’ will not save you from being frequently deceived.

"Australians who have not had the advantage of travel, and indeed some of them who have travelled, entertain what I regard to be very false ideas of Australia's influences in Britain. Something great in our estimation occurs here, and we ask what will they think of that in England? It is very likely that they will not think about it, because they may never hear of it. We read in the Australian papers daily columns of cablegrams about English affairs, but it is seldom that English papers give even a few inches of their space to Australian news. I was for four months in and out of London, and I can with a clear conscience say that, if I had not called occasionally to the branch office of the *Sydney Morning Herald* to glance through that paper's files, I would have known about as much of what was doing in Sydney as we to-day know of life in Central China. Even this colony's Agent-General could not tell me what weather was being experienced in Australia, whether the great drought had broken up, or what was the condition of the political atmosphere. If I had remained another four months I should have become a thorough Cockney. I found in my travels through Britain that I was in the midst of a very sharp race of traders, and gradually learned the meaning of that question which the British business man frequently asks, Where do I come in? I think I said in one of my articles that there was no sentiment in the business between London and Sydney, and that the high, dry, well-crusted honourable merchant of whom historians wrote was not at home when I called. I sought for information, and I delved very hard to get at the bottom of things. I saw wool, tallow, and fruit from Australia sold by auction in a fair and free open way, but when I went for Australian meat and butter my probe was far too short to reach the bottom. I found men very willing to receive information, but very slow in giving anything in return; and I may say that the men who sell meat and butter as agents in Britain rank in my esteem as perfect champions of secrecy. It was after much experience of this kind that I commenced to doubt the value of London quotations. The cattle and sheep sold in the old-fashioned way, which I described in one of my articles as the 'tip and whisper,' formed quite as much a puzzle as the butter and meat. I can positively say that I, an Australian journalist with a fair reputation for being able to obtain information, could never during all my visits to Smithfield or Tooley street enter a note of prices which I could regard as satisfactory. It was not, however, until I had visited other British markets—Manchester, Liverpool, Glasgow, Edinburgh—that I commenced to feel that Australia could never hope for fair prices for her perishable produce until she followed in the footsteps of the Americans and sent to the Old World her own men to do her business. I then wrote to that effect, and attempted to show as plainly as I could that the pastoralists of this colony were receiving 1d. per lb. less than they should for their meat in Britain. But pastoralists, bound as they were by certain financial ties, could not respond to my challenge. What has happened now? One of the keenest speculators in the Old World, Mr. Hooley, advised by some of the best men in England, by his offer endorses what I was bold enough to write eighteen months ago.

"Gentlemen, if there is 1d. more per lb. in meat, there is for you from £5 to £10 per ton more for butter.

"Make no mistake about the importance of knowing what is a true quotation. I am not quite satisfied that some of our sharpest business men here know what is the true quotation of Australian butter and meat in England, and they and you and I will never know until Australians join forces and open Australian depôts in various centres of Britain wherein Australian produce will be sold as Australian, and watched from the time it leaves shipboard until it reaches the consumer's table. I never can, indeed I never shall, forget the remark an astute business man of Glasgow made to me. 'How is it that you Australians are such something asses?' he asked. 'You take some clerk who has had no special training and make him the manager of a meat factory or rate him as a produce expert. Look at the Americans, and you will find men specially trained conducting their trade.'

“What are you doing to secure proper prices for your produce in Britain? Well, I will answer the question. You are spending a lot of money here by co-operation, or you are allowing some bold speculators to spend money in your interests to produce butter as good as can be shown in the world. You have freezing stores and proper accommodation in ships. Past the latter part you do nothing. You send Ministers of the Crown and troops to England, but you halt dead when the marketing of your produce seems to demand all your energies. Remember, the great point is what is the actual price your butter—good, bad, or indifferent—brings in Britain. If butter were sold by auction in London like wool or tallow, I would not hesitate in saying that you might get a true quotation. Business men here say to you, ‘Send your butter through us. We shall have our representative in the old country; or you can send yours.’ And, gentlemen, as I said at the outset of this, I firmly believe we have honest business men; but there is no combination in our business men, and without that you can never gain in Britain sufficient volume of trade to command the respect you deserve. Sell Australian produce in Australian depôts presided over by men of well-known ability and integrity, and let them be well paid for their services. In the depôts agents of known respectability may sell, and in selling learn what they don’t know now—the real value of Australian butter, meat, &c.

How are you to combine? How are Victoria, South Australia, Queensland, and this colony to present a bold front to those sharp British traders? I would have the Governments of the respective colonies to co-operate, form a pool, establish the depôts, and conduct such depôts until the business was on a firm basis. You know the old, well-worn sentiment, ‘Health, wealth, and prosperity.’ Well, gentlemen, why should the State or Government stop after uttering the first of these words. The Government looks after the health, and even goes so far as to have your dairies closely inspected; but when it comes to the furtherance of the wealth and prosperity the Government is to stop—at least, so say some people. ‘Leave this and that to commercial enterprise,’ said the gentlemen who strongly opposed the first acts of this colony’s Export Board; but will the small artillery of those good, honest, and no doubt well-intentioned traders pierce the armour-plate of British markets? I contend that the middleman who opposes this suggestion of the joining of Governments for the purpose of improving markets, effecting better distribution, and reducing freights, should be able to promptly show to you a better plan.

“I am speaking to-day, not as a journalist, but simply as a citizen, one who has at least some stake in Australia. Are the Governments of other countries to act in fostering export trades while the Governments of Australia are to look on and wait for the enterprise which is so slow in its approach? The State here is a big landlord, a big railway proprietor, and is big in several other directions. Let it go past the health stage, and go on so as to promote wealth and prosperity. It may at least be allowed to assist commercial enterprise by forming depôts for the sale of Australian produce in London, Liverpool, Manchester, and other parts of England.”

From Mr. Dowling’s knowledge of the business it may be taken that Australian produce is sold privately in London, which goes to show that the producers are in the hands of traders at this end as well as in England; and every time the produce is handled, the expense is, to a greater or less extent, borne by the producers.

I may ask, How are the producers to find out the actual value of the butter shipped by the various factories to London?

If the farmers imagine that the traders are going to make known the prices obtained, they are labouring under a very great delusion.

I give it as my opinion that if the farmers were paid a price for their milk, based on the prices realised for the butter in London, a great deal more satisfaction would exist among the milk-producers. However, this is a matter for the farmers themselves to consider.

Although, in 1896, we sent out of this colony £42,457 for butter alone, I think it is wise on the part of those engaged in the business to keep on gradually exporting and building up a reputation for Queensland goods in the English market. To further the development of the dairying industry of this colony, many important matters require the immediate attention of the milk-producers. The cost of milk-production must be reduced, and more attention must be given to the breeding and feeding of cattle, to bring about this reform. Aërating, cooling, and more careful handling of milk, are essential to successful dairying. I have spoken so often and written so much of late on the importance of these matters that it is needless for me to repeat myself.

I could not be so foolish as to tell the farmers to collect their present herds and boil them down. Such a thing is not necessary. An improvement may be brought about by culling the present herds and using a good bull with the best cows. This is the cheapest way to become possessed of good stock. The cattle should be bred to suit the country upon which they are to be kept. I really believe that a good Ayrshire bull from a good milking strain, crossed with our present herds, would give good results. The progeny from this cross would, I am sure, suit our climate, and prove good butter-producers. The Jersey cross with a strong-constituted female animal, will give good results. However, there are good and bad in all breeds, and a man who favours any distinct breed is surely ignorant of all other breeds.

The Australian farmers do not place sufficient importance on the necessity of rearing the calf. If the calf be badly fed and stunted in its growth, the constitution will be weak, and it will never make a good cow, not even if selected from the most excellent breeds.

Feeding cattle is one of the most essential points, and one which we must study carefully and adhere to, before we can claim success. It is not necessary to feed the animal when there is abundance of grass, but food should certainly be conserved for a time of need.

To tell a man how and when to feed his cows would, I consider, be an insult to his intelligence. The practical farmer knows, better than anyone else, the crops that his soil is best adapted to produce, and these are the crops he should grow:—

Lucerne is one of the best and most profitable crops that can be grown, and certainly suitable for the production of rich milk. Men who have no knowledge of feeding it to stock, and who certainly cannot know anything about its value as a fodder, are bold enough to tell the farmers of this colony that it will taint milk, which is quite erroneous and misleading. If lucerne tainted milk, more than one-half of the butter shipped from New South Wales and Victoria would be tainted. If lucerne be “wilted” or fed to cows after milking, there is not the slightest danger of a taint being carried into the milk.

Green maize, imphee, and sorghum are all good fodders, and make good ensilage. The best winter fodder that I know of is Cape barley, which requires very little rain, produces a heavy crop, and will stand two or three cuttings in the season. Always give the stock just sufficient food to satisfy their appetite, for if too much be given there will be a waste. One well-fed cow is worth three poorly fed ones. It is needless for me to further dilate on the feeding of stock, but I am quite prepared to answer any question that may be asked later on in the evening.

The cow should be milked at a regular hour each day, and always milked out, as the last of the milk is much richer in fat than the first. The cow should not be beaten or excited during the operation of milking. If the calf be allowed to run with the mother, she can no longer be considered suitable for dairying, as the milking vessel becomes destroyed owing to the calf being unable to consume all the milk the cow is capable of producing.

The person who understands his business will have an equal number of cows in milk all the year round.

MILKING AND TREATMENT OF MILK.

There is, undoubtedly, a vast amount of room for improvement in the methods adopted in milking, and handling and treatment of milk generally. In my opinion, the improvement can only be brought about by compulsory legislation. It cannot be said that the carelessness in this direction is due to ignorance, as the farmers of this colony have had more tuition in these matters than those of any other colony in Australia.

If one man exercises every precaution in milking in a most cleanly manner, cools and aerates his milk, while his neighbour does nothing of the sort and receives the same price for his milk, where does the advantage come in, or where is the inducement offered to the careful man?

It is an absurd statement, or else it is gross ignorance on the part of some persons who are bold enough to state that no instructions have been given the farmers in methods of treating milk. Every pamphlet issued by the Agricultural Department contains full information, and personally I have disseminated knowledge on the matter all over the colony. Nothing more could be done unless men were sent round to stand on the farmer's doorstep and preach the matter to him, and I guess the instructor would then have a warm time of it. Such statements are made by persons who evidently run hurriedly through a district, and imagine that this and that should be done without knowing what *has* really been done.

However, as already stated, if you find one willing to profit from advice, twenty are to be found who will adhere to the old methods, and will continue to do so until compulsory measures are enforced; and it is upon this matter that I challenge contradiction, knowing as I do that compulsion is the only means whereby reform can be brought about. It has been stated that instruction without compulsion would be efficacious, and the same person stated that he had been the means of £200 being spent to get a few farmers out of the old groove, and that, in addition to this, he paid from $\frac{1}{4}$ d. to $\frac{1}{2}$ d. per gallon more for milk carefully handled and aerated, and all this without success, which surely bears out my contention that compulsion must be the predominating power. There is no gainsaying the fact that, if we desire to uphold a reputation for our dairy produce in the English market, we must adopt better methods in the sources of milk supply.

In upholding dairy inspection, I have no axe to grind, and speak only in the interests of the farmers and the welfare of the industry generally.

There are so many so-called experts at the present time, who pose as having a practical knowledge of anything and everything, and really know very little, that, if the farmers were to follow their advice they would very soon find themselves in the poorhouse. I have heard of a statement having been made by a man (who is supposed to have a knowledge of dairying) that, if compulsory inspection of dairies were carried out, the farmer would think the Government had a "down" on him, and would leave the colony altogether or shut down his dairy. I think it must be admitted that the remarks came from a person who knows very little about the ways of the farmer, who will not tolerate anything that is going to hamper any important industry. It does not follow, because a man is a farmer, that he has only sufficient brains to milk his cows or hold his plough. My experience of most of the Queensland farmers is that they are quite competent to conduct their own affairs. Only a few days ago I heard an agent remark that, if the farmer can be kept in the ignorance in which the kanaka is kept by the sugar-planters, they (the agents) could live, and I have no doubt there is some truth in the statement.

I should like very much to see the farmers take up the matter of Government supervision over the exports of dairy produce. If you consider it is not necessary, or that we can keep up a reputation for our goods without it, then I say, Don't move in the matter.

In conclusion, I suggest that the farmers form associations in the various districts, meet once or twice a month and discuss their own affairs, and also co-operate with other associations, and make known the result of the meetings through the medium of the *Agricultural Journal*.

HOW TO TELL THE AGE OF NEAT CATTLE.

THE age of an animal may be ascertained by the teeth until it reaches the age of six years, after which time the horns are the only guide. Cattle cast no teeth until they reach the age of two years, when they get two new teeth ; at three years they get two more, and in every succeeding year two, until five years old, when they are termed “full-mouthed,” although, strictly speaking, they are not “full-mouthed” until they reach the age of six years, because the two corner teeth are not matured until that period is reached.

The age may also be determined by the horns ; but in some cases the most enlightened judge is deceived, as the horns may be scraped or filed in such a manner as to deceive any person.

At the age of two years the horns are without wrinkles ; but at the age of three a wrinkle appears at the base, and every succeeding year another appears ; so by adding two to the number of rings on the horns the age may be ascertained. “Poverty rings” are sometimes to be seen on the horns, which are brought about by starvation when rearing the animal, but are smaller than those brought about by age.

Mr. James Irving, M.R.C.V.S.L., gives the following as the test of age in dairy stock :—

Table of Early Average. Improved Breeds.			Table of Late Average. Improved Breeds.			Table of Late Average. Unimproved Breeds.		
Yrs. Mos.		Number of Teeth.	Yrs. Mos.		Number of Teeth.	Yrs. Mos.		Number of Teeth.
1	9	2 permanent incisors	2	3	2 permanent incisors	2	3	2 permanent incisors
2	3	4 " "	2	9	4 " "	3	0	4 " "
2	9	6 " "	3	3	6 " "	4	0	6 " "
3	3	8 " "	3	9	8 " "	5	0	8 " "

DISHORNING DAIRY CATTLE.

COMMENTING on our article in the last issue of the *Journal* on dishorning cattle by the use of Mr. Armstrong’s new apparatus, a few of our friends, who are (as is every right-minded person) averse to cruelty to animals in any form, have spoken of the pain which must be felt by the animals during the operation, and have suggested that it should be discountenanced. We have spoken to several experts in the management of cattle, and they are unanimous in the opinion that there is no cruelty in the case at all ; that the operation being so quickly performed gives very little pain, not anything approaching that inflicted by trimming the combs of game fowls or docking the tails of horses and dogs. The following remarks from the *Oregon Agriculturist* occur very *àpropos* to the subject :—

The dishorning of cattle is a subject which may be said to be settled in the affirmative as far as the great dairy districts of Illinois and Minnesota are concerned. A journey through these States will show to the intelligent observer that nearly one-half of the cattle are minus their horns ; and it appears to be the case that the large herds have been dishorned more completely than the smaller ones.

On approaching a farmer for his reasons why he had dishorned his stock, he stated that it made the cows more gentle and docile, and that he noticed somewhat of an increase in the milk yield since it had been done. The cows lost the fidgety, nervous appearance, and did not seem to be so much afraid of the leader of the herd.

Now as to the humanitarian side of this question. Humane people who live in towns, and have no practical experience with stock, speak of dishorning as cruel. But it is not. It is an act of mercy to prevent cows from injuring each other, and there is little more pain connected with it than there is in trimming a finger-nail.

The cows were given horns to protect themselves from their enemies, but, in our modern civilisation, man protects the cow from her enemies, and she does not need horns for her defence. Even Mother Nature herself seems to recognise this fact. The great Texas steers, that have to fight for their lives against wolves, bears, and members of their own kind, have long, sharp, cruel horns, with a spread often of four feet, and they have to use them savagely in order to live. The gentle Jersey cow, with man as her friend, and with no persistent enemy larger than a house-fly, has stubby, useless little horns of four or five inches in length, and doubtless Nature will, in time, eliminate even these.

When man removes the horns from domestic stock he is only finishing up what Nature has begun.

Nervousness and dread among dairy cows do not increase the milk-giving. Quietness and gentleness should reign supreme on the dairy farm. If the farmer can teach his cow that she has nothing to fear from the horns of her sister, he will see the result of his teaching in the milk-pail.

Removing the horns, when it is properly done, is not a painful operation, as is evidenced by the fact that it will scarcely interfere with the flow of a cow's milk as much as the chase round the pasture in front of the farmer's dog will do. Those best acquainted with dishorning and its results are its strongest advocates.

SWINE-BREEDING.

NOTWITHSTANDING all that is written about the care of swine, we still find these animals treated with neglect by a majority of farmers. Why this should be the case when so little outlay is required to make them comfortable, is incomprehensible. They are not costly animals to keep. They eat refuse produce, such as cabbage-leaves, small potatoes, sweet-potato vines, damaged corn, and other things which have no value to the farmer except for a compost heap, which, by the way, is seldom met with on a farm. Once a good breed of pigs has been secured, two or three successful farrowings will repay the first outlay, and after that any sales are actually nearly all profit. For instance, suppose a man to pay £10 for a boar and £5 for two sows, an outlay of £15. If the two sows farrowed between them a dozen slips, these would at eight weeks old sell for about £5. This pays for the sows. Two more litters would pay for the boar. But if the young pigs were kept till they attained a weight of from 80 to 100 lb. they would bring from £1 to £1 5s. each, or nearly the amount of the original outlay. Now what have these animals cost to keep? Practically nothing, for they have been the scavengers of the farm, consuming only that which is of no market value. If pumpkins are fed to them, still they have been cheaply kept, for pumpkins are often unsaleable, or, if saleable, then at such market rates as often preclude their being sent by rail to market. There is, however, always a market for pigs, which of course fluctuates according to the supply. Then why not help the pig to make money by taking care of him?

The *Scottish Farmer* says:—In feeding all kinds of pigs, experience has taught us that there are three points which require special attention—(1) The absolute necessity of caution in changing from one diet to another; (2) the

absolute necessity of using nothing but the purest water as drinking water for the swine; and (3) the absolute necessity of protecting swine from the injurious effects of dust. The first necessity has been generally recognised, if not acted upon, by the progressive swine-breeder for some time. The ravages of the recent plague in the United States have emphasised the truth of the second, and we would do well to follow the example and advice of American pig-breeders, whose large experience and greater study of the subject qualify them to speak authoritatively thereon. The third necessity is not so generally recognised as the other two, and yet it is as requisite a condition of good health as either of the others. Swine should not be allowed to wallow in dusty pens, fence corners, or straw stacks. Whenever they sneeze it should be taken as evidence that something is wrong. In swine-breeding, clean sleeping-places are an absolute necessity. It is only when pigs are well bred, fed, housed, and managed that they will yield profitable returns.

The accompanying diagram is a *facsimile* of the yard in which we kept fourteen pigs in comfort. The cost was trifling, as the rails, slabs, palings, shingles, and posts were all split on the farm, and the place was put up during showery weather, when the land was too wet to work, and there was no corn-husking to be done. Each pig had a high and dry bed-place, eight inches higher than its "dining-room." The troughs were filled from the centre gangway, and could be removed to be washed out without entering the sty. In places where timber is plentiful, a few showery days might be employed with advantage in erecting such a yard. On one occasion, during a flood, over 100 pigs belonging to the neighbours found a safe retreat in this place.

MATERIAL REQUIRED.

- 4 corner posts, 8 inches diameter.
- 32 intermediate posts, 6 inches diameter.
- 40 rails.
- 100 slabs for back walls.
- 100 palings.
- 1,000 shingles.

With these the walls and roof are complete. For the subdivisions between the sides—

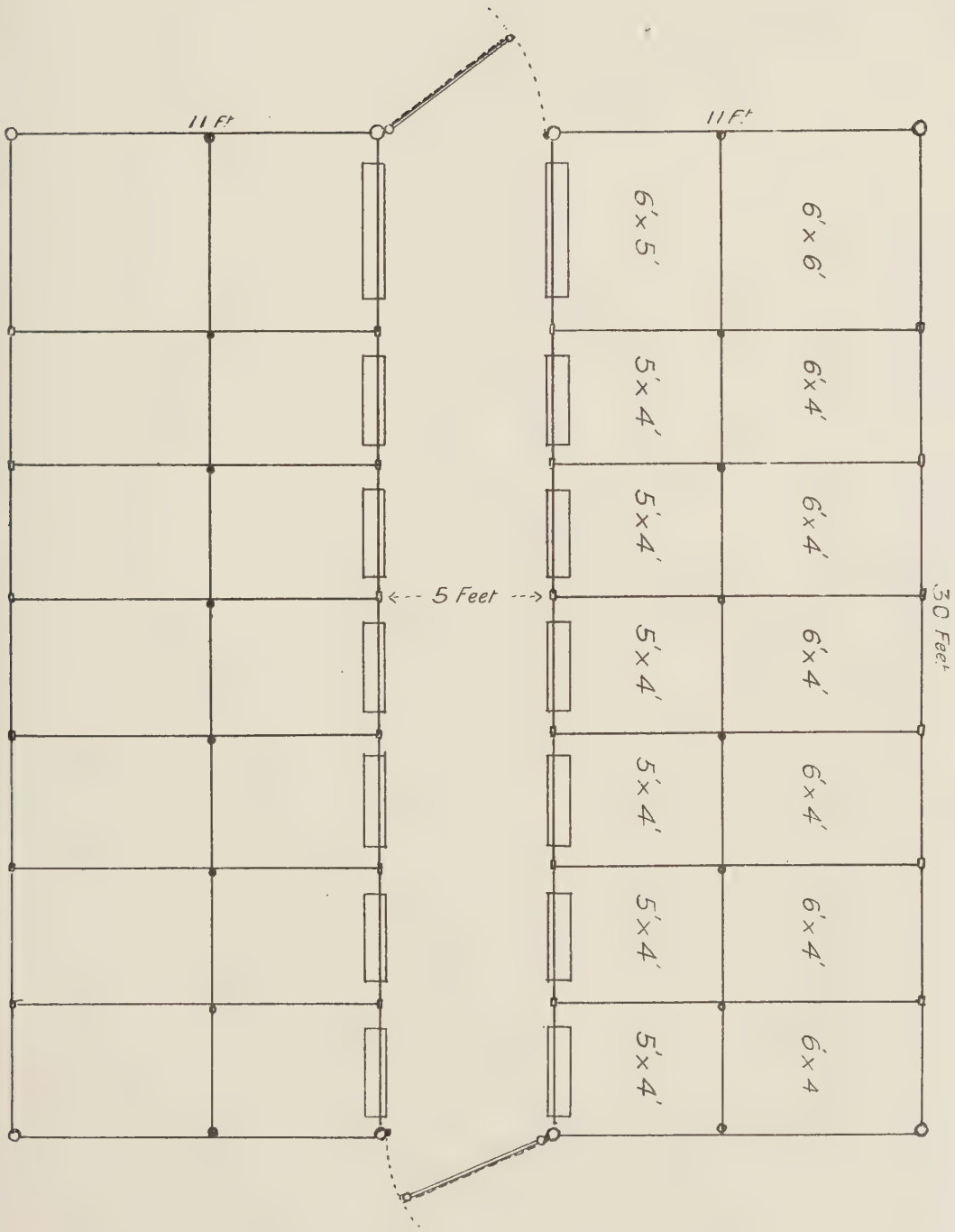
- 36 rails.
- 120 palings for the gangway.
- 100 slabs for raised sleeping-places.
- 16 wooden troughs, which may be made of hollow logs or of sawn timber.

Cost of Material.

The 36 posts cost merely the labour of cutting and carting.

						£	s.	d.
76 rails	...	...	...	...	...	1	0	0
200 slabs	...	..	...	...	...	2	10	0
220 palings	...	...	...	...	...	0	10	0
1,000 shingles	...	...	...	...	...	1	0	0
						5	0	0

If the troughs are made of hollowed-out logs, labour only need be considered, presuming the work is done when no other farm work is possible.



Model Pig-yard.

TO TELL THE AGE OF SWINE.

THE animal is born with eight teeth—four corner incisors, and four tusks.

On the eighth or tenth day appears the second or third temporary molar.

At four weeks old, the four nippers appear—two in the upper and two in the lower jaw.

At the fifth or sixth week, the foremost temporary molars appear in the upper and lower jaws.

At the age of three months, the intermediary incisors have appeared above the gums.

At the sixth month, the so-called wolf's teeth will have appeared, and at the same age appear the third permanent molars.

At the ninth month, the following teeth will have appeared, namely:—The permanent corner incisors, the permanent tusks, and also the second permanent molars.

At the twelfth month, the permanent nippers will be in view.

With the twelfth and thirteenth months, the three temporary molars will have been shed, and their permanent substitutes, which, at fifteen months of age, will have fully appeared, are now just cutting through the gums.

With the eighteenth month, the permanent intermediary incisors and the hindmost permanent molar will have made their appearance; and with the twenty-first month they will be fully developed.

Horse-breeding.

CROSS-BREEDING.

By "ARAB."

THAT the Australian Colonies cannot supply horses suitable for military and other purposes in large numbers, reflects considerably on the past methods of horse-breeding throughout the colonies. Horse-breeding, instead of being a source of national wealth, has become the very opposite, owing to the poor styles raised; the great bulk of our stock being simply grass-eating unsaleable misfits.

Two grave mistakes are mainly responsible for the horse stock of the colony being such as it is to-day: The too general use of the speedy, weedy, handicap racer on the one hand, and the too free use of the heavy draughty Shire horse on the other. Both those extreme types are worthless animals.

The trial made in Australia to form a useful stock by crossing those two extreme types has produced a still more worthless type of horse, which, though fairly serviceable as a slave, is commercially worthless on the markets of the world.

The handicap racer bred for speed has great obliquity of shoulders, pastern and hip bones, but the staying powers have been sacrificed to speed. In the draughty Shire the idea that "weight draws weight" has evidently blinded the breeders of this animal to the fact that there are other factors to strength in a horse besides mere bulk; and we find in him an animal whose straight formation of shoulder, pastern, and hip bones prevents him in a great measure from exerting his muscular strength. The straight formation has been imparted through the mistaken notion of many English authorities on the horse, that a straight shoulder was necessary for purposes of draught.

The failure of those extreme types to "nick well" is but a repetition of what occurred in England some four centuries ago. A writer of that time describes how in England, when there was no further danger from Scottish invasion, they became careless of their horse stock, and allowed the different herds to run together on the commons. If he were writing up our Australian experience, he could not have summed up the results better. We read that the horses in his time were no trotters, but ambled or paced.

The crossing of the oblique formation of the racer with the straight formation of the Shire horse is responsible for the utter worthlessness of our horse stock as a line for profitable export on a large scale—as it was for the state of things described by this English writer on the horses of England in the sixteenth century. It is to-day responsible for the unlevel action of our horses, which compels many of them to amble or pace; this arises from fore and hind quarters being of different formation—the fore may be straight, the hind oblique. The oblique is capable of greater stretch, hence it overtravels the straight forequarter; the pace thus becomes broken—hence the ambler.

To the same cause may be assigned the footlessness (stumbling) we find in so many of our horses; also the want of style and symmetry that characterises the great bulk of our unsaleable misfits.

In Scotland they have never had such an experience as England and Australia have had in breeding misfits through crossing the oblique and straight formations. The improvement of the horse in Scotland dates from

the time of Alex. I. (1107), who possessed a stud of Arabs; and when we consider the influence two or three Arabs have had in the improvement of the English racehorse, since 1710, when the English racer was unable to compete with the Arab for speed, we can realise what influence the Arab stud of Alex. I. must have had on the horse stock of Scotland where, two centuries before the Scottish war of independence, he had been introduced—that he became such a factor in the successful issue of that war, is more readily understood, in view of the results obtained by the few Arabs on the thoroughbred horse of England since 1710.

“Youatt,” who frequently falls into grievous error when writing on the horse, states that gunpowder caused the first steps to be taken in the improvement of the British horse. Edward III. was not of “Youatt’s” opinion, as, when importing fifty barbs from the south of Spain to improve the horse stock of his kingdom, he distinctly sets forth that this was done to protect the kingdom from the invasion of the Scottish horse.

Since the improvement of the horse in Scotland by the introduction of Arabs by Alex. I., history goes to prove that at no time since has the Scottish horse lost the Arab characteristics and superiority then introduced. Though he has been raised from a horse of 13 to 14 hands, as he was supplied to Edward I. for his wars, to a horse of 16 to 17 hands in our day, he still remains what Sir John Sinclair described the Clydesdale in the end of last century as “a huge Arab.” He is more huge now than then, and yet remains Arab-typed. The middle of the present century, owing to the great and sudden demand for a heavy type of draught horse to meet railway requirements, coupled with the ill-judged action of the Highland Agricultural Society vetoing grey colours—disqualifying as it did some of the best Arab types of Clydesdales from honours—was a most crucial time for the Arab-typed Clydesdale, and but for the institution of the Clydesdale stud-book in the early seventies there is no doubt the Arab characteristics of the Scotch horse would have been a thing of the past.

In the fifties Grey Comet (*see* C.S.B.) was carrying off all honours in the show rings, and it was an open secret that he was bred from a Shire mare by a Clydesdale horse. On top he had all the quality and style imparted by his Clydesdale sire, whilst his Shire dam had given him most extraordinary good gaskins, that pulled off the honours from his pure Clydesdale competitors. The deficiency of gaskins in the Clydesdale when compared with the Shire is well known, and evidently arises from the fact that for centuries the Clydesdale has been gradually but steadily increased in size and weight.

Australian experience, in increasing weight of horses for draught purposes by crossing the stock of saddle mares with draught horses, gives the same result as that obtained in Scotland—light gaskins; but in Australia the cross has been of a much more sudden, violent, and extreme nature than anything ever practised in Scotland when raising the Clydesdale; in Australia thoroughbred mares and pure Shire horses of most draughty or straight type being frequently mated, having a most grotesque effect on the gaskins of the progeny.

Grey Comet’s success in the show rings, and the continued demand for heavy horses in the sixties, caused several Scotch breeders to introduce Shire blood. This was not done indiscriminately. The fairs of England were searched for mares, and only those conforming to Clydesdale type were selected. Colts bred from them on the same lines as Grey Comet were the means of greatly increasing the size of the horse stock throughout Scotland. A fact pregnant with instruction to Australian breeders in this connection is that the Shire horses were not used.

The tradition that the Clydesdale originated through the introduction of Flemish blood is an evident absurdity; there are no Flemish characteristics about the Clydesdale. That the weight of the Clydesdale has been drawn in times past, as in our own day, from the Shire horse, no one can doubt who is

familiar with both types. The Flemish origin is evidently a mere cock-and-bull story, concocted to retain a trade secret by parties who had struck a good thing. The Flemish blood would not appear to be so readily obtainable, but, if it were known the improvement was obtained from the border, the monopoly of the improvement would soon have been lost to the possessors.

"Stonehenge" realised that the Clydesdale had greater strength than any other breed of draught horses, but could not understand how it was derived. Had "Stonehenge" and "Youatt" but understood that the greater strength and superior merits of the Clydesdale lay in his conforming to Arab type in his oblique formation, what an improvement in English and Australian horses might have been accomplished since they wrote their works on the horse.

Most horse-drivers have had experience and realised the fact that greater size in a horse does not always give greater strength, and that it is possible to get a little horse that can, in a pinch, lift and pull a heavier load and in a better style than some much heavier horses could. They are also aware of the greater strength of any horse for draught, if, when at a lift, he gets down to his work, with feet set flat down on the ground away in front as well as behind him—getting longer and lower as he exerts himself—compared with another which under similar circumstances gets his feet under him, rises on his toes, and becomes higher and shorter as he exerts himself. But too few breeders and owners seem to be aware that this difference of style of pulling in their horses is a matter of angle of the bones of shoulders, hip, and pasterns: that the one can set his feet flat on ground before and behind and become longer and lower at a lift, simply because his shoulder, pastern, and hip bones are more obliquely set, than that of the poor horse whose straight shoulders and pasterns, &c., cause him to get up on his toes, when he immediately loses muscular power, which his greater weight is quite inadequate to compensate for.

The history of the horse in Scotland is an object-lesson that, properly understood by Australian breeders, must tend to influence their practice and result in increasing the commercial value of our horse stock, and thus add immensely to our national wealth.

The Arab was introduced in the early days of Scotland's "golden age," which began with the Norman Conquest and lasted till she was ravaged by the armies of Edward I. During those two centuries the Arab contributed to the luxury of a wealthy people, and was used for hunting and sport, and it was not until the war of independence that his value in war had occasion to be proved. At this time he was only from 13 to 14 hands high, but his effectiveness as an arm of war was such, that Edward III. was compelled to buy a peace, to enable him to reorganise the military drill and tactics of his time and to import barb blood to improve the horse stock of his kingdom, to meet, in some measure, the advantage the Scotch had obtained through the superiority of their horse. The Scotch Arab had revolutionised the old order of things. His fame extended throughout the whole of Europe, and a profitable export trade supplying the European demand for horses for the purposes of hunt and sport was the result.

His reputation as a cavalry horse was maintained on the Continent throughout the 16th and 17th centuries, and in the 18th he still maintained his superiority, though his size and weight had been considerably increased.

In the coaching days, before railways, horses for this work were supplied in large numbers, which for symmetry, style, pace, and power it would be hard to equal, and I am sure these qualities have never been surpassed. In the early fifties those horses were still plentiful.

As demands for heavier types of horses have been made by the progress of agriculture, trade, and commerce, they have been met without departing from the Arab lines imparted some 800 years ago by the stud of Arabians of Alex. I.

TO TELL THE AGE OF A HORSE.

THE age of a horse is to be accurately determined only by an examination of the teeth. The incisors (that is the cutters, fore teeth which cut) furnish the chief indications. There are six in the upper and six in the lower jaw. The back and hook teeth should also be observed to some extent. The hook teeth (two in each jaw) are situated over the corner teeth (the two outer of the six front teeth in each jaw), beyond the incisors, and having a hooked shape.

When first foaled, the colt has no incisors. Twelve back teeth have in most cases forced their points through the gums, but it is not until from two to three months afterwards that the four nippers appear; in six weeks the nippers are seen, and in about eight months the four corner teeth. There are now, at eight or nine months old, twenty-four teeth, upper and lower, called *foal-teeth*. These are all changed by the fifth or sixth year, and those that follow are called *horse-teeth*.

The back teeth appear as follow:—The three front double pair are seen at birth, and are afterwards changed; the fourth double pair appear from the eighth to the ninth month (these fourth double pairs are the first that remain stationary, and they are found in every year-old colt); the fifth double pair, or fifth four, appear in the second or third year; the sixth usually in the fourth or early in the fifth year. These three double pairs of back teeth (last named) remain unchanged, as do also the four hook teeth.

The hook teeth are uncertain as to time of appearance, coming sometimes at the end of the third year, sometimes in the fourth, fifth, or even in the sixth year. At the age of two and a-half the teeth begin to change, and those which then appear are called *horse-teeth*.

A full-grown stallion or gelding has forty and a mare thirty-six teeth, the male having four hook teeth, which are lacking in the female.

At one year old, the edges of all the incisors are partly worn by friction, while the corner teeth remain uninjured.

At two years, the edges of the nippers, and of the middle teeth and their mark, are worn down.

At two and a-half years, these break through anew as horse-teeth, while the foal-teeth appear as a smooth friction surface.

At three and a-half years, the middle teeth are just breaking through, the outer edges of the nippers are already worn down, and the corner teeth blunted.

At four and a-half years, the corner teeth and hooks are breaking through, the middle teeth are worn only on the outer edge, while the nippers are worn down at both edges.

At five years, both edges of the nippers are worn down, so that the mark is almost gone, the corner teeth have come into wear (having attained to same height as the others), and the hooks are full grown, but not worn at all.

At six years, the nippers are worn down even with the middle teeth; the middle teeth have still a cavity; the inner edge of the corner teeth has worn down even with the outer one.

At seven years, the middle teeth of the lower jaw have become even; both edges of the corner teeth rub, but they have still a small cavity.

At eight years, the incisors of the lower jaw have all become equally worn; in the corner teeth, a mere trace of the mark is visible; and the edges of the hooks are worn down almost half their height. *Notice always that the marks in the upper teeth are twice as deep as those in the lower ones, and so wear twice as long.*

At nine years, the marks of the nippers of the upper jaw have almost disappeared; the middle teeth still show a slight mark; the corner teeth have a deeper mark than the middle ones; the inner edge of the teeth is also worn down.

At ten years, the mark of the middle teeth of the upper jaw is gone.

At eleven years, the mark of the corner teeth of the upper jaw is worn down.

At twelve years, the nippers of the lower jaw have become round—as thick as they are broad; the middle teeth are approaching this state, and the corner ones increase in thickness.

At thirteen years, the nippers and middle teeth of the lower jaw are perfectly rounded, the corner teeth are of increased thickness, and the hooks have become blunt.

At fourteen years, the corner teeth of the lower jaw have become round.

At fifteen years, the nippers of the upper jaw are rounded.

At sixteen years, the middle teeth of the upper jaw are rounded.

At seventeen years, the corner teeth are rounded.

At eighteen years, the nippers of the lower jaw have become triangular.

At nineteen years, the middle teeth of the lower jaw are triangular.

At twenty years, the corner teeth of the lower jaw are triangular.

At twenty-one years, the nippers of the upper jaw have become triangular.

At twenty-two years, the middle teeth of the upper jaw have become somewhat triangular.

At twenty-three years, the corner teeth of the upper jaw have become triangular.

At twenty-four years, the nippers of the lower jaw have become twice as thick as they are broad.

At twenty-five years, the middle teeth of the lower jaw have become twice as thick as broad.

At twenty-six years, the corner teeth show the same development as the middle teeth at twenty-five years.

At twenty-seven years, the nippers of the upper jaw put on the same appearance.

At twenty-eight years, the middle teeth of the upper jaw are twice as thick as broad.

At twenty-nine years, the corner teeth of the upper jaw are twice as thick as broad.

Beyond this we need not go; but we may remark that when horses are large and naturally have larger teeth than smaller ones, the other signs remain the same and the age is easily determined.

Poultry.

FILTHY FOOD AND SURROUNDINGS.

POULTRY-BREEDERS will do well to take a warning from the following, which we take from the *Agricultural Gazette* :—

There is little room to doubt that nine-tenths of all the diseases to which both man and beast are heir are the direct result of the neglect of the laws of sanitation, and in this term we include not only purity of air and surroundings but also—and very especially so—purity of food. We have repeatedly called attention to the very bad practice many poultry-keepers have of throwing down the food for their poultry, for weeks or months together, on to the same spot of ground, often wet and dirty, and thus every bit of food the birds get is contaminated with filth, and, as a matter of course, the food is greatly damaged, and is a ready means of introducing disease.

A serious object-lesson on this question is now brought before our notice in the congested districts of Ireland. Within the last few weeks many of the farmers and others have lost 90 per cent. of their fowls, and it is feared that before the disease is stayed there will be very few fowls left. Hitherto all efforts to cure have proved utterly futile. The disease is styled enteritis, but, by whatever name it is called, it is clearly the result of filthy food and general surroundings. There has been an utter disregard of all laws of sanitation, and thus everything has become thoroughly impregnated with disease germs, and Nature is now dealing out punishment for past carelessness.

Let all poultry-keepers take warning, and, whilst being careful to have roosting-houses and runs, when poultry are in confinement, regularly cleaned and ventilated, above all to take care that their food is perfectly sweet and clean. Soft food ought not to be thrown on to the bare ground, but given in troughs that can be regularly washed, and clean drinking water provided in abundance and placed conveniently for the fowls at numerous spots, and regularly at the same places, as they then know where to get it without drinking from filthy pools; and all grain should be either thrown amongst grass or litter, thus not only preventing its becoming defiled, but inducing beneficial exertion in hunting for it. Referring again to the outbreak in Ireland, it is the most serious visitation that has ever occurred amongst poultry in that country, and there will scarcely be any fowls left in those districts, and the loss need never have occurred had the common laws of health been observed.

TO TELL THE AGE OF A FOWL.

THE simplest way, and one which is adopted by the London poultry-dealer, is to feel the breastbone of the live bird. If the bone feels tender and supple like gristle, the bird is young. If, on the other hand, the bone feels hard and ridgy, the bird is fully matured, and very much so.

SETTING HENS.

MR. GEORGE RYLATT, writing on the above subject, says:—Seeing an article in your last issue of the *Journal* on setting fowls, by an old friend of mine, with great success, will you kindly insert for the comfort of sitting hens, and

for that of their attendants, the mode I have adopted myself? It was discovered entirely by accident. One day I wanted to set a hen, and, not having anything soft at hand, I took some *dried crushed horsedung*, and put it into the box and then set the hen. I noticed this hen always looked healthier than the rest, and when I handled her I found no lice; so I examined her and found nothing but a good healthy comb. I tried the experiment with others, with the same result. I had three hens sitting side by side, and set a second hen on the same nest with equal success. I have done this for over three years with the same satisfactory results, and have reported the matter to several scientific gentlemen, but have not yet seen them to know their opinion. I shall be glad to hear of any improvement on this very simple discovery, as I have never known it to fail.

PRESERVATION OF FEATHERS.

FARMERS very often overlook the value of little things whilst devoting their whole attention to their main crops. Amongst many other minor items of farm produce may be cited feathers, horsehair, pigs' bristles, calfskins, beeswax, &c., all of which we have seen thrown away; and yet all of these are worth money, just as much as are the rags, bones, and broken glass, out of which fortunes have been realised in the old country. Now take feathers. How many hundreds or thousands of fowls, geese, ducks, turkeys, roosters, and pullets are killed weekly by farmers? How many farmers preserve the feathers? Usually the poultry are plucked in the back yard, and the feathers thrown into the rubbish heap, when, if they were preserved, every 2 or 3 lb. weight would suffice to stuff a fair-sized pillow worth from 5s. to 7s. There is very little trouble in preparing the feathers for use. The feathers of ducks and geese are, of course, the most valuable. Next to these come the soft feathers of hens, and after these those of turkeys. All that is required is to dry them in the oven, or put them in thin bags and expose them on a sheet of galvanised iron to the hot summer sun. The coarser feathers of the wings and tails should be stripped from the quills, and then they are equally useful for pillows and cushions. Some people scald the poultry with hot water to facilitate plucking, and the wet mass of feathers is thrown away with the water; but all they require is drying, and subsequent baking to render them as fluffy and soft as those of fowls plucked dry. It is surprising what a quantity of feathers can be accumulated in the course of a year on a farm where there are a large number of poultry. The labour is a trifle once the fowls are plucked, and the feather crop is always saleable, or can be utilised by the housewife, who is never averse to having a good supply of feather pillows.

The Orchard.

PROPAGATION OF FRUIT TREES.

By ALBERT H. BENSON.*

ALTHOUGH it is a difficult matter to bring forward any new ideas respecting a branch of horticulture that has been so extensively written about as the propagation of fruit trees, it is my intention to deal with this very important question from a somewhat unusual standpoint. In my opinion, it is both unnecessary and useless to take up the time of this Association by a detailed description of the various methods of propagating fruit trees now in vogue by nurserymen, gardeners, and orchardists throughout the world, as this is a matter that has been fully described and written about over and over again by competent authorities; so that I purpose confining my remarks to one or two branches of the subject that have not received the attention they are justly entitled to—at all events, as far as Australasia is concerned. The special branches of the subject that I purpose dealing with are—First, the selection of the stock; second, the selection of the scion; and thirdly, the development of new and the improvement of existing varieties of fruits.

THE SELECTION OF THE STOCK.

This is a matter of vital importance, and one that seldom receives the careful consideration it should, as not only should the stock be chosen that assimilates most readily with the scion, and thus forms a complete and perfect union with it, but it should also be the one that is best adapted to the soil in which the tree is to be permanently planted; and in addition to these qualifications, there is one other of even greater importance, and that is the constitutional vigour of the stock itself.

I am strongly in favour of exercising the greatest possible care in the selection of stocks possessing strong constitutions, as it is on the constitution of the stock that the future vigour, freedom from disease, and length of life of the tree largely depend. Seedlings make the best of all stocks—not seedlings raised indiscriminately, but seedlings that are grown from carefully selected seeds that have been obtained from vigorous healthy trees that are known to be constitutionally robust, as the seedlings produced from such seeds are more likely to produce healthy vigorous stocks than those grown from seeds that have been taken indiscriminately from any fruits that are available. Stocks are often raised from cuttings or by means of root-grafting, but such never possess as good a root-system as the seedling, nor have they the same vitality or inherent vigour. But when it is desirable to produce stocks by these means, every care should be taken to obtain the cuttings from strong-growing, healthy, vigorous trees. Be particularly careful to obtain both seeds and cuttings from healthy trees, as many of the most troublesome diseases of fruit trees are transmitted from parent to offspring, especially in the case of citrus and stone fruits. These remarks do not refer to any particular variety of fruit, but to all fruits, as, no matter what kind of fruit you are propagating, if you wish to maintain a high standard of excellence, you must use selected stocks and these stocks, must be selected in the manner I have just described.

* Read at the recent meeting of the Australasian Association for the Advancement of Science, held in Sydney during January, 1898.

SELECTION OF SCION.

In order to produce the best fruit (and by the best fruit I mean that which is of most value commercially, and which pays the grower best), it is absolutely necessary that the same care shall be exercised in the propagation of the tree as the successful breeder of stock takes for the raising of horses, cattle, sheep, or other live stock; and just as the successful breeding of stock depends on the careful selection of the sire and dam, so the successful propagation of the best fruit depends on the careful selection of the stock and scion.

One of the best known laws of Nature, both as regards the propagation of animals or plants, is that like produces like, and that by a careful selection of and propagating only from the best that both animals and plants become improved. This being so, it therefore stands to reason that the greater the care that is taken in the selection of the scion, be it bud, graft, or cutting, the greater the chance that the tree produced from such scion will produce fruit of equal quality to the parent tree from which the scion was obtained, and, if the stock has been selected as well, then that the tree resulting from the union of such stock and scion may be superior to the parent tree.

As the scion, when united with the stock, becomes eventually the entire fruit-producing portion of the tree, it is impossible to over-estimate the importance of selecting the best scions—for as the scion is so will the tree be. This is a point that is often overlooked by Australian propagators, as in many instances the only care that is taken is to see that the scion is of the desired variety that it is wished to propagate, irrespective of the source from which the scion has been obtained; and this, in my opinion, is largely the cause of the deterioration that is taking place in many of our standard varieties of fruits, especially those of the Citrus family.

Thousands of fruit trees of various kinds are annually propagated from scions that are more or less valueless, as they lack one or more of the following qualifications, which should always be taken into consideration when selecting the scion:—

Always select your scions from a perfectly healthy tree, as many diseases are transmitted by the scion.

Always select your scions from a tree that produces heavy crops of the best fruit.

Always select your scions from trees that are good growers and that possess a vigorous constitution. Never select a scion from any tree that is poor in any way—either a poor or uncertain bearer, a poor, uneven, or weakly grower, that is subject to any diseases that are directly transmitted, such as gum, curl-leaf of the peach, or small leaf of the lemon, or that is badly attacked by any scale insect or fungus—as such trees are usually constitutionally weak, for the weaker the constitution of the tree, the more liable it is to disease. As to the scion itself, if a graft, see that the wood is properly matured, or, if a bud, then that the bud is full—viz., properly developed—as immature grafts or buds rarely produce vigorous trees.

One of the great questions the Australian fruitgrower has to deal with at present is to find a market for a large quantity of inferior and medium quality fruits, but, despite this fact, nurserymen are annually propagating thousands of trees of absolutely worthless varieties—trees which when they come into bearing will only produce fruit of inferior quality; and instead of gradually diminishing the output of rubbish, and thus relieving our markets of this unsaleable fruit, our growers continue to plant trees for the produce of which there is no demand, nor is there any chance of their being any, as throughout the world the demand is for first-class fruit, no matter whether it is fresh, dried, canned, or otherwise preserved.

It is therefore to the interest of every fruitgrower in the colonies to obtain and plant out only the very best trees; and to obtain the very best trees, it is essential that only the best varieties be propagated, and that the care that I recommend as necessary should be taken in the selection of the stocks and scions that are to produce these trees.

THE DEVELOPMENT OF NEW AND THE IMPROVEMENT OF EXISTING VARIETIES OF FRUIT.

With the exception of selecting chance seedlings that have shown some special qualifications, such as earliness, productiveness, lateness, or freedom from disease, and propagating the same by budding or grafting, no systematic attempt has been made to produce fruits that are especially adapted to Australian conditions, or even to systematically improve the existing varieties of fruits. In my opinion, this is a matter of such importance that it should be made an especial study by the various Departments of Agriculture throughout Australasia. I am confident that we can produce fruits that will be more suitable to our conditions, and that will be better adapted for the markets for which they are grown—be they local, intercolonial, or foreign—than those that are being commonly grown at present. California owes her position, as the premier fruit-producing country on earth, to the fact that her growers have developed types of fruit that are especially adapted to her conditions and to the markets which she supplies; and that she has grown these fruits only in such districts as are most suitable to the development of each individual variety. Here, on the other hand, our growers have done little if anything towards the development of special types; and as to their confining their attention to the variety or varieties of fruits that are best adapted to their individual soil or climate, it is often one of the last things they have thought of, their orchards being more often conspicuous for the number rather than for the excellence of the varieties grown.

There is no need to go outside of Australia, however, to see the effect of careful selection in the propagation of plants, as Dr. Cobb's exhaustive experiments in the breeding of new and the improvement of existing varieties of wheats show us what results can be obtained; and I see no reason, if equal care is taken in the propagation of fruit trees to that exercised by Dr. Cobb in the production of his stud wheats, why our fruits should not be improved in a similar or even in greater proportion.

In addition to selection, there is the important question of developing new varieties by hybridisation, and this particular work opens up such a wide field for experiment that good results can only be achieved as the outcome of many years of extremely careful work, so that it is a matter entirely outside the scope of the ordinary propagator or fruitgrower, but is the province of a specialist such as Luther Burbank, of Santa Rosa, California. This is a matter that belongs by right to our Agricultural Departments, as it is more a public than a private question, for, no matter how skilled the operator may be, the production of a new variety possessing distinctly valuable qualities, not possessed by any existing variety, is not accomplished more than once in many thousands of experiments. Still when such a hybrid has been produced it is a great acquisition to the fruit industry, and of more or less commercial value to it.

There is, as I have before stated, a wide field for conducting experiments in the hybridisation of fruits, as we have many varieties which, though of especial merit in some particular, are yet of no commercial value owing to some other cause. Thus a tree may produce a fruit of exceptional quality which it is extremely desirable to have in quantity, but it may be either a very poor bearer, a stunted weakly grower, or very liable to disease; so that if a hybrid can be produced possessing the exceptional qualities of the original variety without its drawbacks, it is a decided gain.

Or, to take another example, we have a fruit that possesses every good quality except that it is a bad keeper and shipper, and we cross it with a fruit that is an exceptionally good keeper and shipper, and the resulting hybrid possesses the good qualities of both parents. Thus we have again produced a fruit that is a decided gain and of commercial value to the country producing it.

The development of new varieties specially adapted to Australian conditions can only be achieved by systematic hybridisation, but the existing varieties of fruits may be improved by careful selection.

In conclusion, I may state that I have written these few notes on the Propagation of Fruit Trees in the hope of drawing attention to what I have felt for some time—viz., the necessity for our producing nothing but the best and for stopping the propagation of the large number of worthless varieties of fruits of all kinds that are always more or less of a drag on our markets and an injury to the fruit-growing industry of Australasia.

Viticulture.

FERMENTATION OF MUST.

By E. H. RAINFORD,

Viticulturist, Queensland Agricultural Department

As the vintage is commencing, a few words of advice to some of the less experienced vigneron on the necessity of care and attention to the conditions under which their must is fermented will be opportune. The suggestions offered are sanctioned by the teachings of eminent French wine experts and my own practical experience, and, if followed out, will undoubtedly be of assistance to winemakers in making *sound* wine, which is of the first importance.

One of the most important points in winemaking, too often neglected by beginners until learnt by costly experience, is the necessity of having your must fertilised by the right kind of ferment or yeast germ, and no other. An infinity of species of ferments exists, a few for good and the rest for evil from a winemaking point of view; one, the *Saccharomyces ellipsoideus*, performs the functions of turning grapejuice into wine. This microscopical organism has the power of assimilating the sugar in the must, and decomposing it into carbonic acid gas and alcohol with a small quantity of glycerine and succinic acid. The organisms are born in the must from spores or seed which adhere to the exterior of the grape, and, having attained maturity, they reproduce by subdivision, a portion of their organism being thrown off, which quickly becomes a fully developed and reproducing germ; this is repeated until the parent is exhausted and dies. They are so microscopical that a cubic centimetre (two-fifths of an inch) is said to contain 120,000,000.

If the *Saccharomyces* is born in a must with its constituent parts properly proportioned, and its functions be not interfered with by intruders, the resultant wine must be good and sound; but, unfortunately for vigneron, a host of enemies are ever on the alert to spoil his wine if they are allowed to have a hand in the making of it. To mention a few, there is the *Mycoderma vini*, a germ which, instead of converting sugar into alcohol, converts it into water, thereby diminishing the strength of the wine and laying the foundations of future trouble; the *Mycoderma aceti*, which changes the nascent alcohol into acetic acid or vinegar; the germs which turn sugar into lactic acid and butyric acid, thereby communicating to the wine a disagreeable taste and smell as well as non-keeping qualities; and, lastly, germs of putrescence which attack and decompose albuminous substances in the must. If all or any of these noxious germs are introduced into the must, and by their reproduction interfere with the work of the *Saccharomyces*, the result will be to damage the quality of the wine, in a degree greater or less according to the number of the intruders. The only way of avoiding this danger is to practise the strictest CLEANLINESS—cleanliness of your surroundings, cleanliness of your utensils, cleanliness of your grapes; this last is most necessary.

It will frequently happen that grapes have to be carried long distances, necessitating a delay of many hours, even days, before they are milled, and, consequent upon rough handling, many of the berries are broken in transit. All these grapes should be well washed with clean water before crushing, either with a hose, douch, or pails; the grapes being spread upon a suitable cement or wooden bed, or, if on the ground, upon clean sacking.

The escaped juice from the broken berries will, after the lapse of some hours, have been infected with myriads of inimical germs; the longer the interval, the greater their number, hence the necessity for their removal even if it entails a small cost. The same precaution should be observed with grapes that have been picked overnight and kept in bulk; of course, sound grapes fresh picked do not require any treatment, and can go straight to the mill.

All utensils that have been in contact with must, and not used for some hours, should be washed before further use, as these swarm with germs. A very good plan is to keep in the cellar a tub of water mixed with a small quantity of sulphuric acid in the proportion of, say, 1 pint to 100 gallons, enough that the water is sourish to the taste; this is an excellent disinfectant with which to rinse your pails, pump, vats, &c.

Avoid throwing your marc and stalks just outside the cellar, or very shortly each breeze will waft clouds of invisible spores inside ready to germinate in a favourable medium; take it away into the vineyard or elsewhere as far off as possible.

Be careful to clean up without delay must drippings, broken grapes, marc, and rotten fruit of any kind; these all become infested with germs.

Avoid having stables adjacent to the cellar. If it cannot be helped, then observe the greatest possible cleanliness in them; look upon it as though you were combating typhoid—the noxious germs are the typhoid of wine.

For a certain time after crushing, the must is comparatively inactive—the *Saccharomyces* take a little time to develop from the spores and reproduce. If, during this period, fully developed inimical germs are, through want of care and attention, introduced into the must, they will at once begin multiplying and converting the sugar into matters foreign to good wine before the *Saccharomyces* can get to work; if, instead, the latter have a clear course before them, a short, healthy, complete fermentation ensues, and a sound wine with a good bouquet is your reward.

A careful farmer sees that his seed is clean and of the best quality. Were he to sow his land with wheat mixed with the seeds of noxious weeds, what kind of a crop would he get? And he should be doubly careful in sowing his must, as it is possible for him to clear the land of the weeds, but once your inimical germs, your poisonous weeds, get into your must there is no undoing the evil they work.

The following is a good way of starting a quick and healthy fermentation in must:—Twenty-four hours before vintaging, choose a quantity of the soundest and ripest grapes from the *best quality of vine* in your vineyard—sufficient to make twenty or thirty gallons of juice—and with clean hands or a small mill crush them into a very clean hogshead with the head out; cover the top of the cask with a clean linen cloth. Fermentation will have started by the time you commence your vintage, and this yeast should be sprinkled over the fresh grapes as they are milled; a sound, healthy fermentation will be quickly started, if care has been taken to keep out the noxious germs. This is a step in the direction of fermenting with cultivated yeasts, and at no cost to the vigneron. By selecting his grapes from the best quality of vine that he has or can procure, he produces a yeast that influences beneficially the must of inferior quality of grapes as well as starting a vigorous and sound fermentation. Of course if your vineyard is a large one you can prepare twice or three times the amount of yeast.

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In the earlier part of this article, the equilibrium of the constituent parts of must was referred to as being essential to the work of the *Saccharomyces*; it is a point to which vignerons are often inattentive, and the consequences may be serious.

For the *Saccharomyces* to do its work efficiently it must exist in a medium of sufficient acidity, and when this falls too low, as will happen in rainy seasons, or when the grapes are too ripe, or from other causes it is unnecessary

to enter into here, the germs lose some of their vitality, and perform their work more or less imperfectly, for micro-organisms as well as animals and plants have need of special surroundings and nourishment to be able to develop and multiply; the battle for existence is as imperious a law for them as for other living creatures; and if the medium in which they fall is unfavourable, other species, more robust and less sensitive to their surroundings, will develop at their expense and interfere with their activity.

This want of equilibrium should therefore be corrected. A must of 1,100 degrees density ought to contain not less than .8 to 1 per cent. by weight of tartaric acid, unless it is intended to be strongly fortified to arrest the fermentation at an early period—in that case the percentage of acidity is not of importance; but for light dry wines like chablis, claret, &c., the amount of acidity should be carefully regulated, otherwise the conversion of the sugar will not be thoroughly effected, the colour will be unstable, and the wine prone to after-fermentation.

This danger will be avoided by the addition of sufficient tartaric acid to bring the acidity up to the proper percentage, or by vintaging the grapes before they are fully mature. Unfortunately, not all vignerons possess the knowledge and apparatus necessary for an analysis for acidity, but if a sample of the grapes, or a small bottle of the must pasteurised by boiling, be sent to the Agricultural Department in Brisbane a day or two before the vintage takes place an analysis would be made, and the inquirer informed of the result. In sending grapes or must for analysis, care must be taken to select a few small bunches or portions of a bunch from different points in the vineyard and of a medium state of ripeness.

* * * * *

It is of great importance that the temperature of the must should be properly regulated during fermentation, as this has great influence on the character of the future wine. The most favourable temperature for the ferment germs to work in is between 77 degrees and 95 degrees, but unfortunately in tropical and semi-tropical climates the atmosphere of the cellar at the time of the vintage frequently passes the latter point, and the fermenting mass of must and marc in the vats will rise to 100 degrees and over; when this happens the *Saccharomyces* lose some of their vigour; whilst the noxious germs are unaffected by the temperature, and may increase in numbers to a dangerous extent. It should be the object of the vigneron to reduce the temperature as much as possible by artificial means, even at a small cost, if he has at heart the quality of wine he is making. The most perfect way of keeping the temperature at any degree you desire is by using refrigerating machinery, but this, of course, can only be done in the largest and best-equipped cellars; after that the best effect is obtained by the circulation of a stream of cold water through the must by means of a metal coil inside the vat, taking care that the surface in contact with the must be tinned and that the diameter of the coil be not too small, otherwise the reduction of temperature will be slight. The water can be sent through the coil by gravitation or by pumping as circumstances permit, regulating the flow to do the most work. In default of either of the above systems, the temperature can be materially lowered, and at a relatively small expense, by immersing in the vat a tin cooler, round, and four times as long as its width, containing a refrigerating mixture of pounded ice and salt. This arrangement should be fixed so that it stands well above the marc and sufficiently firmly to permit the contents to be occasionally stirred. If the cellar is so situated that none of the above expedients are feasible, then do your best to cool the atmosphere by a liberal use of wet sacking about the cellar, enveloping your vats in the same material, and occasionally spraying them to keep up an evaporation.

Wood being a bad conductor of heat, it is well to avoid using that material in the construction of fermenting vats. Excellent results have been obtained in Algeria by the use of enamelled iron vats; if these are not obtainable, ordinary

iron tanks lined with glazed tiles or cement would do good service, but careful handling would be necessary not to detach the lining. Slate and cement tanks are largely used in South Australia for fermenting in.

Recollect that the greater the mass of marc, the higher the temperature will rise; so do what you can to diminish its bulk by eliminating the stalks wholly or partially, unless absolutely necessary to retain them.

In offering the above suggestions to vigneron, I wish to impress upon them the fact that, apart from the influence which the quality of the grape brings to bear on the wine, the fermentation is that which decides whether a wine will be good, medium, poor, or bad, and its favourable or unfavourable progress will depend on the care and attention shown by the winemaker. Recollect that the fermentation is the manufacture of the wine, so to say, and that grapes pressed anyhow, and the must put anywhere and left to take care of itself, will no more produce good wine than flour, eggs, and sugar alone and unassisted will make a sponge-cake. The anxious care of the vigneron should be shown more now than any other time. Recollect that the future quality of your wine, and consequently its value, depend upon a quick and healthy fermentation taking place. Do then all you can to bring that about.

APPOINTMENT OF A VITICULTURIST.

THE Queensland Department of Agriculture has secured the services of Mr. E. H. Rainford as Viticulturist. Mr. Rainford has spent many years in Sicily, engaged in the work of viticulture and wine-making. There is ample scope for his abilities in these directions in Queensland, and we trust that the instruction to be imparted by him to our wine-growers will be laid hold of earnestly and bring forth fruit in the shape of improvement both in our wines and in the method of grape-vine cultivation.

Botany.

CONTRIBUTIONS TO THE QUEENSLAND FLORA.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

Order PALMÆ.

HYDRIASTELE, Wendl. et Drude.

H. costata, *Bail.* (n. sp.). (Referring to the prominent ribs on the fruit.) The tree Mr. Jardine had cut down for the specimens he sent me stood 87 ft. high, the trunk circumference being 41 in. Leaves glabrous, except for a dense, close wool which clothes the lower part of the petioles and sheaths; sometimes a very slight patch may be seen upon the rhachis. The rhachis above the 1 or 2 ft. petiole from 8 to 11 ft. long, $1\frac{1}{2}$ in. broad near the base, from which it tapers upwards, the upper portion laterally compressed. Segments all free, the apical ones very narrow and shortly decurrent but not confluent; the lowest also very narrow and distant, about 60 on each side, those of the centre of the leaf 3 ft. (not interrupted as in *H. Douglasiana*, *Bail.*), folded and attached to the sides of the rhachis, tapering to almost filiform ends. Inflorescence below the leaves, in a pendulous dense flagelliform panicle; the common peduncle about $1\frac{1}{2}$ in. long, showing the scars from whence 2 or 3 bracts, or the spatha and two bracts, had fallen, the portion of the peduncle which clasps the stem much thickened, primary branches short, thick, flattened, or angular, the ultimate spikes 15 to 18 in. long, densely covered with fruit (no flowers seen). Perianth under the fruit about 2 lines diameter, segments broad, the inner ones twice as long as the outer ones, and are not so spreading as in *H. Wendlandiana*. Fruit when dry oval-oblong, about 4 lines long, very dark and glossy, with many prominent light-coloured longitudinal ribs, some of which are shorter than the others. Embryo basal, erect, albumen not ruminant.

Hab.: Somerset, Cape York Peninsula, *Frank L. Jardine*. After a careful examination and comparison of the two Queensland species of this genus with a few dried fruits and a single leaf-segment, given to me by the late Baron Mueller, of the Liverpool River species, and the description of *H. Wendlandiana*, W. et D., I am fully convinced that they are specifically distinct from that species. In fruit, *H. Douglasiana*, *Bail.*, somewhat closely resembles *H. Wendlandiana*; but there is a wide difference in foliage, the terminal segments of both being confluent at the base. *H. costata* differs in that the leaf-segments are all free, and the fruit has much more prominent ribs than the other species; some of the ribs are thick, almost corky, their light colour contrasting strongly with the dark, almost black, fruit (at least when dry). The pretty red fruits of the other two species dry a pale colour.

ARCHONTOPHÆNIX, Wendl. et Drude.

A. Jardinei, *Bail.* (Referred to in my contributions to Queensland Flora, *Queensland Agricultural Journal*, Vol. I., Part 3.) Described by Mr. Jardine as a tree of 32 ft. in height, with a stem circumference of 12 in. Leaves pinnate, glabrous, 5 to 8 ft. long from top of sheath to apex, the petiole or portion without segments only about from 6 to 9 in.; sheath probably long, but only 16 in. of it upon the specimens to hand, without the torn, loose fibrous matter, common to many palms, closely sheathing the stem and ending on the opposite side of the stem in an erect point 2 or 3 in. long

from a broad strongly striate base. Segments or pinnae about 30 on each side of the rhachis, often distant, 18 to 25 in. long, and sometimes 2 in. broad at the centre, folded and attached at the base to the flange-like edge of the rhachis, the apex usually long-acuminate or abruptly jagged, and on one side elongating into a point which is at times toothed on the inner side and ending in a filiform point; terminal segments not confluent, green on both faces. Inflorescence below the leaves, 16 to 24 in. long and broad, pendulous; the common peduncle $1\frac{1}{2}$ to 3 in. long, 1 to $1\frac{1}{2}$ in. broad, rather slenderly clasping the stem, marked by 2 scars showing the attachment of fallen bracts; rhachis and branches thick, flattened, or more or less angular, puberulous, 1 ft. or more of the branchlets bearing closely sessile flowers, solitary or 3 at each notch, a female with a male on either side. Male perianth-buds oblong, about 3 lines long, the outer segments imbricate, orbicular, about 1 line in diameter, margins ciliate, inner ones valvate, oblong, exceeding the outer by about 2 lines. Stamens 20 or more, about as long as the perianth, filaments shorter than the anthers. Anthers versatile, basal lobes somewhat spreading. Female perianth much shorter than the males, both series broad, the inner ones somewhat apiculate. Fruit not matured on the panicles seen, but the albumen seems to be very deeply ruminant.

Hab.: Somerset, Cape York Peninsula, *Frank L Jardine*. This plant differs from all other species of *Archontophoenix* and *Ptychosperma* hitherto met with in Australia; thus I am glad to attach to it the name of one who has rendered good service to botanists.

LIVISTONA, R. Br.

L. humilis, *R. Br.*, var. Trunk 7 or 8 ft., clothed to near the base by the old leaf-sheaths and portions of the petioles. Leaves very numerous, forming a very dense head. Petioles without the sheath about $3\frac{1}{2}$ ft. long, and from 2-in. broad at the base to $\frac{3}{4}$ -in. at upper end, where the upper face forms a rather prominent ligula, smooth, edges rather acute, usually bordered in the lower half by small curved prickles; leaves of a very harsh texture, nearly orbicular in circumference, about $2\frac{1}{4}$ ft. long and scarcely as broad, entire for about half the length, then divided into numerous narrow infolded segments, which at their extremities are more or less deeply forked, and each fork tapering to a thread-like end. The thread-like bristle between the segments at the first forking of the leaf short, and here the margins of the segments often minutely serrated. Inflorescence, forming elongated panicles, numerous amongst the leaves, attaining about 4 ft. in length, upon a peduncle of about 16 in. Bracts closely embracing the rhachis, the lower ones exceeding 1 ft. long, the upper ones gradually smaller, striate, abruptly acuminate; secondary ones narrower, with a prominent finely serrated keel, ending in a longer acumen. Branchlets slender, flowers numerous, solitary or in small clusters, but none on the specimens to hand. Fruit not quite ripe, oval, about 6 lines long, the pericarp thin, wrinkled outside. Seed nearly globose, about 3 lines diameter, endocarp pitted.

Hab.: Cairns, *E. Cowley*.

L. humilis, *R. Br.*, var. The tree Mr. Jardine had cut down for the specimens he forwarded to me stood 47 ft. high, and gave a trunk circumference measurement of 25 in. Leaves (two received) were cut off above the sheath. Petioles, the longest over 5 ft, the upper end about $\frac{1}{2}$ -in. broad, ending on the inner side in a triangular ligula of about 1 in. long, the lower end more than twice as broad as the upper; both faces clothed with whitish furfuraceous scales, the margins armed in the lower half with strong, short, curved, or straight prickles, the upper end of the sheath decurrent on the face of the petiole, on both sides within the margin forming long, light-brown, woven fibres. Leaf-expansion about $3\frac{1}{2}$ ft. long, and not so broad, not so orbicular, and of a more membranous texture than other Australian species of the genus; segments narrow, forking at about 4 or 5 in. from the base, and

again at a little more than half-way up, tapering thence to long, fine points; a bristle in the lower, but seldom in the upper forks. Inflorescence an elongated panicle. The one received from Mr. Jardine was 7 ft. long, base of common peduncle 2 in. broad, and as well as the secondary peduncles flat on the one side and rounded on the other. Bracts closely sheathing, obtuse at the end, branches 8, forked towards the extremities, and bearing numerous flexuose slender spikes of fruits (no flowers seen). Fruits on the specimen to hand not mature, pyriform or oblong-ovate, 4 or 5 lines long, pericarp smooth.

Hab. : Somerset, Cape York Peninsula, *Frank L. Jardine*. I place this and a palmate-leaved palm from Cairns as varieties of Dr. Robt. Brown's *Livistona humilis* for the present; but hope to have full and complete material for a more satisfactory arrangement when working up the order for my work now in hand on the Queensland Flora.

PLANTS REPUTED POISONOUS TO STOCK.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

ORDER CYCADACEÆ.

THE plants of this order are all considered to possess more or less of a poisonous principle, which becomes inert or expelled by heat. Several of these plants in other countries yield nutritious food products, and the Australian species are known to be used by the Queensland and other Australian aborigines for food after undergoing a careful preparation. The handsomest of the Australian kinds are met with in Queensland; and if fruits of these, correct to name, could be obtained and forwarded to Europe, they would fetch a good price from the nurserymen. It is not, however, from this view of the subject that we at present have to deal. One, if not more, species is reported as dangerous to stock when they browse upon the plants. The species considered in Queensland the most hurtful and to produce "rickets" is *Macrozamia Miquelii*. As, however, there seems to exist a somewhat confused idea, even amongst some stockmen, as to the genera, I will try and put the subject in as brief and plain a manner as possible. The representatives of the order in Queensland are 4 *Cycas*, 8 *Macrozamia*, 2 *Bowenia*.

Three of the *Cycas* are purely tropical, the other (*C. media*) alone being met with south of Rockhampton.

Most Prominent Characters of the Genus Cycas.—Stems cylindrical, sometimes forked; some species tall. Leaves simply pinnate, pinnae (leaflets) linear, with a prominent midrib. Male cones oblong or globular, the scales cuneate (wedge-shaped), hard, the thickened apex more or less produced into a straight or recurved point. Female cones at first globular, but opening out by the growth of the central shoot; the scales elongated, tomentose, or woolly, flat, bearing on each margin 2 to 4 ovules, in distant notches; the apex of the scale dilated, acuminate, and more or less deeply toothed; the scales are at first loosely imbricate, at length spreading or pendulous among or from the growth of the plant below the leaves, retaining often for a considerable time the rather large globular or oval fruits.

Of the eight species of Queensland *Macrozamia*, *M. Miquelii*—the one mostly accused of injuring stock—is most abundant in the Leichhardt district, but is not confined to that locality, for we find plants of it on the ranges near Brisbane. It seldom forms any stem above the ground, and the bases of the leaf-stalks are more or less densely covered with a loose wool, which has been found useful for stuffing pillows. *M. mountperriensis* resembles in many

respects the last-mentioned, but I am not aware of its having been suspected of injuring stock; probably the species is rare or local. The species most frequently met with about Brisbane is a form of *M. spiralis*, and is easily distinguished from others by the absence of pinnæ on the lower half of leaf, and its almost cylindrical petioles (leafstalks). *M. Douglasii* is, so far as at present known, peculiar to Fraser's Island, and is evidently a close ally of *M. Miquelii*. The curiously twisted leaved species, *M. Paulo-Gulielmi*, makes but few leaves, and these have very narrow pinnæ; as a rule, also, this species forms a more decided aboveground stem than any of those before mentioned; plants of it are to be met with at Maryborough and Stanthorpe. *M. Moorei* is the large, spiny, tall-stemmed species, met with near Springsure; the harsh nature of the leaves alone should prevent this species being browsed upon by stock. *M. Denisonii*, of Tambourine and other mountains of Southern Queensland, and *M. Hopei*, found about the Daintree, Johnstone, and other localities of the tropical parts, are tall-growing species, with very broad pinnæ and cones often exceeding 3 ft. in length. The foliage of these two species one would imagine to offer a more tempting bite than any of the kinds before mentioned, but that we never hear of any harm occurring to cattle browsing upon them may probably be attributed to the usual abundance of superior food in the localities where they grow. It must be borne in mind by all stockowners, however, that the fruit of all these plants is as pernicious as the foliage, and probably more dangerous; therefore care should be taken to have the fruit of all carefully destroyed before they come to maturity. This would remove a present danger, as well as check the spreading of the plants.

Most Prominent Characters of the Genus Macrozamia.—Stems cylindrical, sometimes forked, seldom tall, most frequently not formed above the ground. Leaves simply pinnate. Pinnæ linear, with several longitudinal, scarcely prominent, nerves contracted and often callous at the base; when young frequently hairy. Male cones always much narrower than the female ones, often more or less curled after maturity, cylindrical, the scales above the middle of the cone with a central erect point. Female cones oblong or irregularly-globose, from a few inches to over 3 feet long. Scales with one pendulous fruit (seed) on each side; the apex with an erect or recurved, long, or short spine. Fruit longer than broad, somewhat angular, covered by a more or less fleshy integument.

The genus *Bowenia*, so far as at present known, is limited to a single species, of which there is a well-marked variety. *B. spectabilis* was first met with by A. Cunningham at the Endeavour River, since which it has been found in many other parts of tropical Queensland. The variety differs from the normal only in that its pinnules (secondary leaflets) are serrated. It was first found by M. A. Thozet near Rockhampton.

This genus differs from *Macrozamia* only in having bipinnate leaves, and in the absence of a point to the cone-scales. The stems are not formed above the ground. The rhizome is eaten by the aborigines like the yam. So far there is no account of this plant having been suspected of poisoning stock, but it is not met with upon grazing country.

EXPLANATION OF FIGURES.

(See Plate.)

- Fig. 1. *Cycas*. Pinnæ attached to leaf-rhachis.
- Fig. 2. Male cone.
- Fig. 3. Scale of female cone with fruit attached.
- Fig. 4. *Macrozamia*. Pinnæ attached to leaf-rhachis.
- Fig. 5. Male cone.
- Fig. 6. Female cone.
- Fig. 7. *Bowenia*. Upper portion of pinnæ with pinnules.

(All more or less reduced.)



Queensland Cycads.

THE CHIEF SYMPTOMS OF THE DISEASE CALLED "RICKETS."

Loss of proper control, co-ordination, over the movements of the hind limbs, which cause the animal to exhibit symptoms of paralysis (*paraplegia*), more or less distinct.—*Dr. T. L. Bancroft.*

Cattle of every description take the disease, but young stock in poor condition are more subject to it.—*Dr. T. L. Bancroft.*

Affected animals may improve, but seem never to recover completely.—*Dr. T. L. Bancroft.*

Popular Botany.

OUR BOTANIC GARDENS.

No. 3.

By PHILIP MAC MAHON,
Curator.

As you enter by the gate opposite the Queensland Club for our third walk in the Gardens, you will notice on your left hand, immediately inside the entrance, a large bed of *Cannas*. It is made up of three varieties, and these are so beautiful and so easily grown that we may pause a few moments to admire them.

The *Canna* in the outer line is named Madame Crozy. It is of a beautiful scarlet colour, the edges of the flower-leaves (petals) being edged with yellow, like the gold lace on an officer's coat. The leaves are a brilliant green; it grows vigorously, and flowers profusely. Inside this is a row of a slightly taller and much more beautiful *Canna* called *Italia*. The flower is like that of a most beautiful orchid. The groundwork of the outer flower-leaves (scientists, pray pardon the homely language—these lines are not written for you) are of a bright yellow, blotched and spotted with a red, approaching scarlet. The inner flower-leaves are mainly red with a margin of yellow. If blended by man, these colours would look hideously incongruous, but Nature makes no mistake in the blending of her pigments, and the result in this case is distinctly beautiful. The flowers average from 5 to 7 inches across. This plant sold only twelve months ago in the southern capitals at £1 10s. for a tiny offshoot, and it was from three such offshoots obtained from Italy that our present considerable stock was raised.

The central group differs from the rest in having the leaves of a purplish colour. The flowers are smaller than the other two, but the colour of the leaves renders it very useful for producing pictorial effects. Its name is Gloire de Lyon. These plants are easily propagated from offsets, but must have rich ground to grow in. Plenty of manure should be added to land not naturally rich. They are particularly suited for cottage gardens if well arranged, since they do not need so much attention as other plants, and their growth is so vigorous that they rapidly smother weeds.

A little further on, upon the left, you will come upon two trees, now in flower. They are tropical trees, and, apart from the exceeding beauty of their flowers, there is a very useful lesson to be learnt from their history during the past few years. They are labelled African Tulip-tree (*Spathodea campanulata*), and they come from the tropical portions of Western Africa.

You will notice that they are a mass of glossy green leaves, and that the bright flowers, shaped like a seashell, and having a lace-like margin delicately fringed with golden yellow, stand out in bold clusters, the whole plant showing health and vigour. Well, two years ago these plants were nearly dead. It was a question whether to grub them out or make an attempt to save them. You have often seen orange-trees and other fruit trees suffering in the way in which these were. The ends of all the branches were dead, most of the leaves had fallen off; the few which were left were yellow and faded, mutely protesting against the state of things under which the poor plant was striving to exist. When a plant looks like that, there is something wrong with the roots. A trench was dug around the trees, 6 feet from the trunk and about $2\frac{1}{2}$ feet deep; a drain was led from the bottom of this trench to

lower ground ; all the old earth was removed as far in amongst the roots as was possible without injuring them ; all the main roots leading into the bad soil were cut back at the trench with a very sharp knife ; stones were placed in the bottom of the trench to about 9 inches deep ; sods were carefully spread on these, grass side down, and draining tiles and stones were put in the drains. The trenches were then filled up with good soil. All the dead wood was cleaned out of the two trees, and in a short time they seemed to have received a new lease of life.

Root-pruning is not practised in this country nearly as much as it should be. By following the above simple plan many trees might be saved and rendered fruitful, which are at present slowly dying. Much of the disease of which we read, and many pests—insect and fungoid—are induced by the conditions under which the roots are endeavouring to perform their duties, and one of the first steps to be taken is to so improve the general health of the plant that it may be able to hold out against its natural enemies.

We pass along the course taken on our last walk, when it will be remembered that we left off our talk at the Lily Ponds (K. 9 on the map). As we journey towards the same point, we pass two objects of interest just now, as they are in full flower. One is the beautiful shrub called the Queen Flower (*Lagerstræmia indica*, var. *Matthewsii*). One truss is a bouquet in itself, but it is only when one pulls the single flower and examines it closely that the exquisite beauty of its form becomes evident. It consists of six lilac flower-leaves delicately crimped as though done by some cunning artist, and so highly set on to the central cup (calyx) that they tremble with every movement. Another of these plants represented in the Gardens grows to the stature of a tree in its native country (India), and has great value as a timber. It is the Jarool (*L. flos-reginæ*). The wood is hard, and takes a high polish. Both varieties may be found in flower in a large bed at H. 8.

Another conspicuous object is a very fine clump of two species of *Allamanda* (*A. Schottii*), with a beautiful bright yellow flower 5 inches in diameter, and *A. Hendersonii*, with a flower of similar colour, but only 2½ inches across. These plants are allowed to trail naturally over a raised trellis. This is the way to grow them in order to display their full beauty, and certainly the group here referred to is a most beautiful object, and proves that even the native plants of such a country as Brazil will thrive here with a vigour hardly exceeded in their native home.

We have now arrived at the point where we left off last month, at the most southerly of the lily ponds. (The Brisbane River at the Gardens runs almost from south to north.)

To the right, on a bank, is a bed of plants of the curious Cacti, peculiar to dry regions in Central America, but particularly to the dry upland plains of Mexico, where they form, with Agaves and other thick-leaved plants, almost the sole vegetation. The prickly pear belongs to this class. It is regarded with undiluted horror in Queensland. In Mexico it renders travel possible over the arid plains, which otherwise would be impassable except perhaps to camels.

In a report from Her Majesty's Legation in Mexico to the Marquis of Salisbury, its value as food for cattle and sheep is dilated upon. The writer, who is the manager of the Atlan Land Company, says:—"My experience is that the plant is almost invaluable in hot, dry, and specially sandy countries, where vast stretches have to be crossed by ox-teams, and there is little or no water for man or beast. Some years ago I was well acquainted with that almost desert country lying between San Antonio, Texas, and Chihuahua, Mexico, long before the advent of railways in that part, and when nearly all the wool grown in the western part of Mexico found its way to San Antonio, Texas, by means of large trains of ox-wagons ; and I may safely say that had it not been for that providence of Nature, the prickly pear, the large traffic could not have been carried on, nor could the vast herds of sheep have been maintained in that dry, arid region. . . . It is the custom, when teams of ox-wagons are travelling, to send men on ahead in the afternoon to the place of camping

for the night to prepare the supper for the oxen. Arriving at the destination, these men set to work collecting piles of dried cactus leaves and roots, with which fires are made—and here I may mention that in the absence of wood the dry plant makes excellent fuel; then the green leaves (or flattened branches, to speak strictly) are chopped off the plant, stuck on forks, and toasted in the flames until all the prickles are burnt off, when the leaves are cut into convenient chunks for the animals to masticate. This food should be allowed to cool well before it is eaten, or it will produce indigestion and diarrhoea. Cattle work and thrive on this food alone, and can go without water for several days without any apparent shrinkage in flesh or loss of muscular force. It is very curious to see the teams of oxen brace to their work and go ahead as soon as they see or smell the fire where their supper is being prepared; and when they have finished their cooked rations and are turned loose or herded, as the case may be, for the night, they will search for the ripe fruit of the plant, which is sweet, nutritive, and juicy, and abounds in great quantities nearly all the year round. . . . Sheep will get fat in a country where there is little or nothing else but prickly pear; the plant needs no cooking for them, the narrowness of their mouths enabling them to gnaw at the leaves between the prickles; the leaf once opened in this manner, it is an easy matter for the sheep to get at the remainder of the pulp. Sheep require little or no moisture in a prickly pear country.”

In the same bed with the cacti are a number of plants, allied to the lilies, known as Agaves. These are used in their native countries for various purposes, but chiefly for the fibre which is found in abundance in the succulent leaves. The Sisal hemp is of this kin, but it has been fully discussed by Mr. McLean in a recent number of the *Journal*. The plant known popularly as the American Aloe (*Agave americana*) produces a fibre known as Mexican grass. It arrives in London from Tehuantepec. The Mexicans prepared from it an intoxicating beverage called pulque, to the consumption of which Cortez found the higher classes of the people much addicted when he entered their capital in 1519. A piece of the leaf of this plant, if scraped and applied as a poultice to a bruise, rapidly cures it. Occasionally a man happens to get a black eye (almost invariably in chopping wood), and there is no remedy which will reduce that eye to its normal condition quicker than a piece of the leaf of this plant. It must not touch the eye itself, or it will cause considerable pain.

This is often called the “century plant,” because there is a popular idea that it blooms only once in 100 years. It would be equally true to say that it blooms once in 10,000 years only, because when it blooms it dies. It may bloom at any time from three or four years of age upwards, but it is usually seven years old before it flowers, and it may not flower for many years.

In the same bed is an interesting plant which is now “poling,” as it is called. It is the Mauritius Hemp (*Furcræa gigantea*). It throws up a long spike, and on this are borne, in great profusion, little bulbils, each capable, when it reaches the earth, of sending down roots, and becoming an independent plant. It will be interesting for constant visitors to watch this plant from time to time, and note its development. The value of the exports of the fibre of this plant from Mauritius is about £50,000 per annum.

A little further on to the left hand is a large bed of the Coffee Shrub (J. 9). This bears abundant crops of good heavy berries, which are always used for seed. The plants were not treated all along as coffee is treated on plantations, and, in consequence of having been pruned like an ordinary shrub, they have a crowded appearance, but the space is limited, and much show could not have been made in it.

In a report dated 1877, twenty years ago, Mr. Hill, who in those days did much good work in importing useful plants and making our resources known abroad, speaks of this plot as having been recently planted. He refers to the fact that the coffee leaf disease had not yet put in an appearance. He evidently expected it, and quite naturally, for it has spread into Java, Sumatra,



ARENGA SACCHARIFERA. GOMUTI PALM. HEIGHT, 42 FEET.

Mauritius, South Africa, and Fiji. It has not, it is stated, yet appeared in any part of America or the West Indies, although coffee cultivation has been carried on there for very many years; nor has it appeared here during the twenty odd years that coffee has been growing here.

Coffee has been grown in India for about 240 or 250 years, according to Tavernier, and it is stated by the Reporter on Economic Products to the Government of India that there are near Calcutta coffee shrubs nearly a century old which bear profusely, and from which coffee of good quality is still prepared. There were, in 1893, 127,548 acres under coffee in British India, and the imports are steadily increasing, the exports in 1893 being 299,337 cwt. The annual imports of coffee into Great Britain amount to 60,000,000 lb. Coffee has passed out of the experimental stage in Queensland. It is now being cultivated on a somewhat large scale in the neighbourhood of Cairns and Mackay. An interesting leaflet on the industry was printed and circulated by the Cairns Chamber of Commerce at the recent Exhibition in Bowen Park. A very few hints to intending planters may be useful—

1. Sow heavy seed. 2. Transplant when large enough to handle into deep good soil, or, if it is not intended to transplant, sow in such soil. Bamboo tubes are excellent to transplant the small seedlings into; split when planting out finally. 3. Do not let the plants become too large before final planting. 4. Never injure the tap root, which is long; see that it goes down perfectly straight when planting. 5. Stake out the place of every plant before you begin planting. Bamboo stakes are admirable. Let all your lines be absolutely straight.

Just in front of you stands a very noble palm in L. 10, on the point where two walks join (*see illustration*). It is also one of the most famous and useful of all the palms. It is the Gomuti Palm (*Arenga saccharifera*). Seeman and others say that in its native countries (the islands of the Eastern Archipelago) it attains a height of between 30 and 40 feet. This specimen is 42 feet in height. Nine years ago, when the writer first saw it, its height was not over 12 feet, so that during that time the rate of growth has averaged 3 feet 4 inches per annum. Around the bases of the leaves, forming a kind of sheath, is found a sort of horsehair-like material which is used, throughout the countries in which the palm is found, for every variety of cordage and rope, but it is chiefly as large cables, designed to resist wet, that it is used by Europeans. It is the most durable of vegetable substances, and a mere catalogue of the uses to which it is applied would be a formidable one. It makes an imperishable thatch; it is fashioned into ornaments for the person, into mats, articles of household conveniences innumerable; the hunter selects the long, straight, coarser fibres, sharpens one end, tips it with poison, wraps around it a little vegetable cotton to fit his blow-pipe, and is in possession of a weapon which he can use with deadly effect on man or beast or bird. Is it not curious to find the use of the blow-pipe practised by savage people so far apart as South America and the Indian Archipelago? The juice of this palm is used in the manufacture of toddy, arrack, sugar, vinegar. When it becomes too old to yield toddy, the trunk gives an excellent sago which is prepared from the pith, though this is inferior to the produce of the true sago palm. The plant dies when it has ripened its full crop. Close by may be seen a large plant which has died in this way, and is now used as a basis for ferns which grow amongst the bases of the old leaves. This is seen in the illustration. But even when dead its career of usefulness is not finished. It is then hollow, lasts well under ground or in wet places, and is used for pipes, water channels for irrigation, &c., and a variety of other useful purposes. This palm is easily propagated from seed, will flourish well in Queensland, and prove most useful if any effort is made to take advantage of its economic qualities.

In this country there is too great an adherence to British customs in dress, houses, furniture, diet, &c. Consequently, only those vegetable products which seem to come nearest to those to be found in the old country are in any

great demand. This conservatism is bound to become broken down with the lapse of time, and many products which we never dream of using now will be largely availed of.

We are now in the midst of a group of Palms, but there is only space to mention one more this month—the Palm *Sabal umbraculifera* of which the artist of the Department furnishes us with an illustration. What a noble plant it is, and as we look at it what a variety of purposes we can imagine its broad leaves and stout leafstalks serving to the inhabitants of a tropic land! How much more cool and grateful than the thin screed of corrugated iron between one's head and the broiling sun is the thick thatch of different species of fan palms! What house can equal for coolness an up-country Indian bungalow? Its main posts are of hardwood, its beams bamboo, its walls are of a reed—the Ekra grass; its roof is of a grass like the kangaroo grass of Queensland, often laid on to a depth of 3 feet; its verandas are wide and low, and being heavily thatched are comparatively cool.

This *Sabal* is a native of the West Indies, from whence it was brought in 1825, though the particular island from which it originally came is not determined. It is believed to be Cuba. Our plant is only a baby yet, as this palm sometimes grows to the height of 100 feet. That in the Gardens is 42 feet high, which curiously enough is the height of the Royal Palm close by, as well as the Gomuti Palm above referred to. The Royal Palm seems a little higher, because of a stray leaf which stands above the crown.

A tree which always rivets the attention of visitors is now in flower, a short distance off, at the entrance to the “bush-house” (this is an awkward expression: “shade garden” is much better); and truly it is a beautiful tree which should be largely planted. It may be readily raised from seed. The head forms a flat umbrella-like canopy; the leaf is as beautiful as the frond of the most graceful fern. It reaches about 2 feet long, and has a central midrib with other small ribs on both sides like a herring-bone. On these smaller ribs are placed the small leaflets, $\frac{1}{4}$ -inch long. About 2,400 of these go to each fully formed leaf, be the leaf small or large. The flower is cerise, divided, as regards the coloured flower-leaves, into five, which stand erect like banners. The lower one is a kind of platform for wandering insects to alight on. It is coloured white near the edge, and yellow further up. It leads to the nectary; the pollen-bearers (anthers) bend down to deposit their dust on the back of the visiting insect, who, all unconsciously, transfers it to another flower. This is evidently done by a large moth in its native country, Madagascar, where there are several plants so adapted. Take a flower and leaf, and examine them. You will realise what the Rev. H. Ward Beecher expressed so beautifully when he said, “Flowers are the sweetest things God made and forgot to put a soul into.”

Next month we will chat further about the Palms.

BOTANIC GARDENS.

SEEDS FOR EXCHANGE, WITH SHORT DESCRIPTIVE NOTES.

By PHILIP MAC MAHON,
Curator.

THE seeds mentioned below are available for exchange, and small quantities of those desired will be sent to persons who previously send us seeds or plants desirable to obtain for the Gardens, or for exchange with foreign countries. Country correspondents can help us in a number of instances. There are almost always procurable, in every vicinity, seeds or plants of some remarkable or useful native trees or plants; and even though the name be not known, by sending a portion of the plant between a few thicknesses of paper, it will be generally possible to identify it. Seed-pods should also be sent, and if possible



SABAL UMBRACULIFERA. GIANT FAN PALM. HEIGHT, 42 FEET.

flowers. In the case of orchids, which we always want in any quantity, it will be better to dry them slightly in some place out of the sun, and then pack them loosely in a well-ventilated basket, box, or even a sack, and despatch.

Ferns and other plants must be kept moist at the roots, in one of the many ways which will suggest themselves to any intelligent person. A capital "bush" plan for sending plants long distances is to take a sheet of bark a little longer than the plants, and lay the latter in, packing around the roots with any absorbent material to hand, such as moss, the peaty bases of staghorn ferns, half-decayed leaves, or anything which will hold the moisture, or, if nothing better is available, with earth. Then draw the sheet of bark up around the plants, secure them to prevent falling out, and, bringing the two edges of the bark as near together as you can, tie it in a few places. Then put another sheet on top, and securely fasten, so as to make a cylinder in two pieces. A piece of bark must be put in at roots to prevent the material used for packing from falling out. This is better done before the parcel is finally secured. Of course a cylinder of bark stripped from a tree or sapling may also be used. The writer has carried plants packed in this way for weeks, with some attention, and then sent them a considerable distance; they arrived at their destination in good order. Joints of green bamboo are good to pack small plants in. Flowers carry a long distance if closed up tightly in these.

Native birds are also useful for our aviary. It is desired to form as good a collection as possible of these; and any which can be sent will be very acceptable.

Anything which may be intended for the Gardens can be placed on rail or boat, addressed to the Curator. Arrangements will be made at this end as regards freight.

When anything is about to be despatched, it would be well to advise the Curator by postcard or letter.

Other seeds than those mentioned below are being constantly added to our stock. Early application is necessary, as many seeds soon lose their germinating power, and consequently are not kept long in stock.

To describe the methods of sowing and cultivating every separate plant referred to below would take up a great deal of space, and could not be properly done within the limits of this *Journal*. A few hints on seed-sowing with special reference to those seeds will not, however, come amiss.

On a small scale the best way to raise seeds is in boxes. Fruit-boxes, or the cases in which corrugated iron is imported, will suit very well. A light shelter can be easily run up with a few forked sticks for uprights; in the forks can be laid a few long bush poles; a covering of ti-tree twisted amongst these, and you have a shade-house quite as effectual as the most elaborate structure. A great mistake is usually made in making those shade covers too dense. Almost all shade-houses are made too dark, and plants refuse to grow in them. All the shade-houses in the Botanic Gardens are covered extremely lightly, just enough to make a kind of broken light, and you will notice that the most delicate plants flourish with a luxuriance which it would be hard to excel. A shade-house for seed-growing should be low, otherwise the young seedlings will become drawn and unhealthy. If you can spare the time to excavate a walk about three feet deep all the better, because then you can walk freely under your roof, and work conveniently at your seed-boxes on both sides without stooping, whilst perfect drainage is provided. The walk must, of course, be drained. In the *Journal* it is hoped to publish shortly a plan and section of a seed-raising shade-house in which hundreds of thousands of seeds have been successfully raised here within the past year.

In the article on Logwood seed in last month's issue will be found directions for preparing and draining seed-boxes, and this will apply to preparations to be made for most seeds. The following brief rules will be found useful:—

1. Provide free drainage.
2. Provide light soil with plentiful admixture of leaf mould.

3. Sow thinly and evenly.
4. Cover the seeds with their own depth of soil only.
5. Keep lightly shaded, gradually removing shade as the plants grow strong.
6. Keep moist, but not sodden; do not allow soil to become baked.
7. Transplant into beds of light soil as soon as plants are a few inches high.
8. Reject all puny and ill-formed seedlings.
9. Plant out in showery weather before roots become too far advanced. This will vary with different plants.
10. Prune back all straggling or injured roots with a very sharp knife.
11. Prevent roots being exposed to air by "puddling"—i.e., dipping in a thick "paste" of clay and water.
12. Shade by sticking a branch in the earth on the sunny side of your young tree.

Alphitonia excelsa. Red Ash. Eastern Australia. Tree.
Antidesma Dallachyanum. Herbert River Cherry.
Antigonon leptopus. South America. Pretty climber.
Aristolochia elegans. A beautiful climber.
A. ornithocephala. Dutchman's Pipe. A curious climber. Our plant is much finer than the type.
Barklya syringifolia. A very beautiful Queensland tree.
Bauhinia alba, *B. purpurea*. Flowering trees.
B. Hookeri. Queensland Ebony. A beautiful shade tree.
Bignonia tweediana. A showy hardy creeper.
Bixa Orellana. Arnatto Shrub. South America.
Buckinghamia celsissima. Tree with showy flowers. Queensland.
Caesalpinia pulcherrima. Barbadoes Flower Juice.
Calliandra pulcherrima. Having flowers like red tassels.
Callitris robusta. Cypress Pine. Tree. Australia.
Caryota Rumphiana. A very handsome palm from the Indian Archipelago.
Cassia fistula. Indian Laburnum. Beautiful pendant yellow flowers.
C. pistaciifolia. Tree. Yellow flowers.
Cedrela Toona. Red Cedar Tree. Queensland. A valuable timber tree; wood largely used for furniture and many other purposes.
Chrysophyllum olivaceforme. One of the Star Apples. Tree. West Indies.
Coffea arabica. Coffee Shrub. A number of young plants also available.
Diploglottis Cunninghami. Queensland Tamarind Tree.
Diplothemium maritimum. Palm. Brazil.
Dombeya mollis. Shrub. Madagascar. All the plants of this family contain strong fibre in their bark.
Duranta Plumieri. The tall growing shrub so largely used for hedges in Queensland.
Erythrina indica. Tree. Most showy flowers. Coral Tree.
Eucalyptus. Various species.
Eugenia Smithii. Tree. Lilly-Pilly. Acid fruit.
E. uniflora. Brazilian Cherry. Acid fruit, much liked by some.
Ficus macrophylla. Moreton Bay Fig.
F. religiosa. Peepul Tree. Fine tree, should do well in the North. Useful timber. Large leaves; often used for painting on.

Gardenia florida. A well-known pure white fragrant flower.
Gleditschia triacanthos. Honey Locust Tree. Makes impenetrable hedges if planted closely. A good bee plant.
Fraxinus excelsior. The European Ash.
Grevillea robusta. Silky Oak.
Hibiscus elatus. Cuba Bast Tree.
Ilex paraguayensis. From the leaves is made the celebrated Maté or Paraguay Tea. A dense shade. Small tree.
Lafoensia punicæfolia. Tree. Not good for shade. Flowers curious.
Lagerstræmia flos-reginæ, *L. indica*. Very showy shrubs. Lose their leaves in winter.
Macadamia ternifolia. The Queensland Nut. Small tree, brilliant green, edible fruits (nuts).
Melia Azedarach. The Neem, or Margosa Tree of India. Makes a good shade tree. Grows on poor soil. The fruits produce oil.
Morinda jasminoides. Shrub. Australia.
Murraya exotica. India. Shrub. Very fragrant.
Myrospermum pereiræ. Balsam of Peru.
Nerium oleander. A tall flowering shrub. Poisonous.
Oreodoxa regia. Royal Palm. South America.
Panax elegans. A handsome native tree.
Panicum crus-galli. A strong-growing grass known as Barnyard Grass. Valuable for cut fodder.
Panicum maximum. A nutritious fodder grass.
Pittosporum eugenoides. New Zealand Tarata.
Poinciana regia. A beautiful shade and ornamental tree.
Quercus pedunculata. British Oak.
Quisqualis indica. Rangoon Creeper. Vigorous and beautiful.
Ravenala madagascariensis. The Traveller's Tree. Magnificent foliage.
Rhipogonum album. Climber. Australia.
Ricinus communis. Castor Oil Plant. An improved variety.
Sabal Adansonii. A fine palm.
Schotia latifolia. A good shrub with showy flowers.
Sesbania aculeata. Fibre makes strong cordage.
Spondias pleiogyna. Burdekin Palm. Queensland.
Sterculia acerifolia. Flame Tree. Queensland.
Tecoma stans. Shrub.
Terminalia Arjuna. India. Timber valuable; also produces a gum used locally.
Thuya pendula. A conifer.
Tobacco. Large leaved; and Fly River, New Guinea.

Seeds recently Collected.

Terminalia Arjuna. See above.

Calliandra pulcherrima. Pretty shrub.

Chrysophyllum olivaceiformis. See above.

Bixa Orellana. A dense shrub. From South America. Yielding the Arnatto used in colouring cheese, dyeing silk, &c.

Eugenia uniflora. Described above.

Murraya exotica. See above.

Eugenia brasiliensis. A tree grown in South America as a fruit tree.

Tricholena rosea. An ornamental grass, very good to cut for decoration.

Cassia fistula. See above.

Erythrina cristagalli. A beautiful shrub.

Grevillea robusta. Silky Oak.

Myrospermum percaræ. See above.

Callitris robusta. The Cypress Pine.

Apiculture.

BEEKEEPING.

NOTWITHSTANDING the low price of bar-frame hives, and the simplicity of their construction, we yet continually meet with the old familiar gin-case doing duty as a hive. The Langstroth hive should have long since displaced these old-fashioned contrivances. With it, bee-keeping becomes a pleasant, scientific, paying pursuit. And this brings us to the question of instruction in apiculture. In the United States and in Canada, the business is as systematically taught as any other rural industry. It is taught as a science. There is an association in England known as the British Beekeepers' Association, which grants certificates to proficient students on their passing a regular examination in apiculture. Queensland is the paradise of the honey bee. In former days, and indeed even now, timber-getters, fencers, farmers, and, in fact, all bush settlers, supplied themselves lavishly with honey from trees which they felled in the course of their business. This was not the honey of the little native stingless bee, but that of the European brown bee. We have seen as much as six large buckets of honey taken from a single hollow tree. This honey was worth in Brisbane 1s. per lb. At one time when the aborigines were more numerous in the Southern districts than they are now, it was customary to lend some natives a crosscut saw and an axe, and to provide them with a quarter-cask of a capacity of 25 gallons. This they would fill in a couple of days at a charge of £1. Many settlers made a large profit out of the transaction. This crudely extracted honey, however, would to-day command a very poor price, as the bulk of it was very dark and mixed with many impurities. The *modus operandi* was to track bees to a tree, which was then felled. The hollow portion containing the colony would usually split open, and the angry swarm issuing forth was at once subdued by a fire of green bushes which emitted a dense smoke, under cover of which the bee-hunters enlarged the opening, and transferred the comb to buckets. The honey was then extracted by squeezing the comb (including larvæ, bee-bread, &c.) through mosquito net. The wax was usually thrown away. The bush still holds countless swarms of bees, but very little is now done in the way of collecting it. It is easier and more profitable to make use of frame hives and to cultivate the Italian bee. The average quantity of honey per hive per annum may be set down at 50 lb., and it sells wholesale at from 2d. to 2½d. per lb. Comb honey in 1-lb. sections was sold in London by Mr. F. Chambers, of Laidley, at 5d. per lb. An offer of £2 per cwt. was not accepted. The quotation for good extracted honey in the *Produce Markets Review* (London) is £2 10s. per cwt. for English honey, and 7s. for 7-lb. jars. California honey in jars is quoted at 8s. per 7 lb. Pure beeswax averages 1s. 9d. per lb. in the English market, and the finest bleached wax 2s. 6d. per lb. Jamaica honey brings £1 14s. per cwt. in London. It is said that Australian honey is not to the taste of the British consumer, owing to its reputed Eucalyptus flavour; but this is stated by Queensland beekeepers to be pure imagination. Our bees prefer to gather honey in the sweet-scented maize-fields and in the flower gardens to wandering off into the bush in search of Eucalyptus blooms. Besides, the time during which the Eucalyptus is in flower is of very short duration. Wattle blossoms are frequented by bees, but, as the wattle is not a Eucalypt, there can be no unpleasant flavour from this source. Beekeepers would do well to sow patches of lavender. On the Lower Rhone, in France, there are large fields of lavender, and the farmers' bees are taken at so much per hive on flat boats to gather stores of honey from these fields during the spring and summer, when they are returned to the owners, together with full hives of deliciously fragrant honey.

WAX-EXTRACTING.

IN every well-managed apiary, whether large or small, provision should always be made for collecting every scrap of old and discarded comb and bits of foundation, to be converted into wax at the close of the season when the general take has been made. Any old close-fitting box is handy for this purpose, and it will surprise anyone to see the quantity of these scraps that can be gathered during a single season. Good clean beeswax always finds a ready sale. Of the different kinds of wax-extractors in the market very few are suited for the purpose; they are either too slow or too expensive. Wax-extracting is such a messing job that it is best done right off, using as few of the kitchen utensils as possible if one wishes to avoid getting into trouble with those in charge of that department. Perhaps the simplest, best, and readiest method of rendering wax is with the wash-house boiler. Half fill the boiler with clean rain water, and to every five gallons add one tablespoonful of sulphuric acid (vitriol); this separates the wax from certain impurities, and imparts to it a rich colour. Collect all the combs and press them firmly into a clean empty sugar bag, of a size sufficient to get inside the boiler, and tie the same firmly. Place a milk plate or other dish in the bottom of the boiler before the bag of comb is put in, so as to prevent it catching to the bottom and so get burned. The bag should now be held by some means under the surface of the water. As the water boils the wax will ooze out of the bag and float on the surface, where it can be ladled into a dish or allowed to cool in the boiler, and lifted off in one sheet of wax. All the refuse and dross is kept inside the bag, which may now be lifted out and thrown away. A second melting of the wax is required to make it marketable; thus, procure an old tin can or pail, and into this put the wax with a little water at the bottom. Place this can inside of the boiler—glue-pot fashion—with sufficient water only to cover the can about two-thirds. As the water gets heated the wax will melt in the can, when it can be lifted out and poured through a piece of cheese-cloth into any dish and allowed to cool slowly. The result is a cake of nice clean wax. Where the apiary is of any size it is best to have dishes made and kept entirely separate for this branch of beekeeping. A very useful and cheap wax-extractor can be made from an old five or six gallon iron drum, by cutting off one end and attaching to it a strong handle to hang over the fire. Combs are put into this the same way as already described, without messing other dishes that are in daily use.—*Agricultural Gazette*.

Horticulture.

PERFUME-MAKING AS AN ADJUNCT TO HORTICULTURE.

WE have already given directions in this *Journal* for the capturing and retaining of the scents of flowers. We now again revert to the subject, as we desire to see the perfume-making industry one of the regular minor operations of the farm and garden. As there is no heavy manual labour attached to the operation of scent-producing, and as women and children, and we are glad to state many men also, are naturally fond of flowers and flower gardening, we feel satisfied that once undertaken in a proper manner the business will be continued as a pleasurable occupation for a few short morning hours. There are several processes by which scents are obtained, such as the cold process, the hot process, and distillation. We cannot do better than give the explanation of these processes, as written by an expert to the *San Francisco Weekly Examiner* :—

THE COLD PROCESS.

Procure trays with glass bottoms (such as were described in the *Queensland Agricultural Journal*, 1st Dec., Part 6). Spread clarified fat a quarter of an inch thick upon each side of the glass; gather the flowers early in the morning, and spread thin upon the fat. Close the glass-sided box. Every second day replace the old flowers by fresh ones, and renew them twelve or fifteen times. Then scrape the fat from the trays, break it up into very small pieces and digest it in spirits of wine 60 over-proof—say 2 lb. of fat to 2½ lb. of spirit. Stir every day for a month, keeping it covered. Then bottle and label it “Extract No. 1.” Now add fresh alcohol to the fat (1 lb. is sufficient), and stir daily for a month. Pour it off then, and label the bottle “Extract No. 2.” Do the same thing a third time, and so obtain Extract No. 3. Now you have three bottles, all containing different strengths of extract, and all of value according to their strength. The fat is now melted in a *bain marie*, is poured off, and kept for next year. (In Queensland scent production can go on all the year round.—Ed.)

THE HOT PROCESS.

Take, say, 2 lb. of flowers, being careful that there are no stems; put them in a round tin. Melt 4 lb. of clarified fat, with only just sufficient heat to melt it. Pour it over the flowers, and leave them covered till next day. Now get a larger dish with hot water to melt the fat, on the same principle as the glue-pot. This is called by the French a *bain marie*. Now take another round tin containing 2 lb. weight of the same kind of flowers. Place two strips of wood on top of this to hold a sieve. Then pour in the melted fat from the first pan, thus straining the leaves and allowing the fat to fall on the fresh lot of leaves in the second tin underneath. Cover up, and again leave till next day. Clean the first tin ready for the morrow, so as to repeat the operation each day for fourteen days, when the fat will be fully charged and is ready to be digested in spirits of wine, as described above. Only sufficient heat is required to cause the fat to melt and flow, as the extracts are very volatile at a high temperature, and a great loss may be occasioned by overheating the fat.

If more rose leaves are gathered than can be used on the same day, sprinkle them with salt, when they will hold their scent for a few days. This is called salting the leaves. For oils of the same plants, coarse cotton cloths are imbued with the finest olive oil and laid upon a frame containing wire gauze in

lieu of glass; on these the flowers are laid and suffered to remain until fresh flowers are procured. This operation is repeated several times, after which the cloths are subjected to great pressure to remove the now perfumed oil.

How to Make the Clarified Fat.—Take 7 lb. each of beef, mutton, and pork fat; chop fine on a board, and wash in clear cold water; then put in a boiler with five gallons of fresh water; put on the fire; add 2 oz. of alum and a handful of coarse salt and forty cloves; boil until all the fat is melted; then get another basin with five gallons of fresh water, and skim the fat through a wire strainer into the fresh water; now boil a second time (adding the same quantity of salt and alum) for one hour, and then let cool. On each occasion of its cooling a dark-coloured sediment is found at the bottom. This must be carefully scraped away. When the fat is perfectly white and pure throughout, it is re-melted and put away for use.

How to Make a Cheap Still.—Construct a metallic tank of about 100 gallons capacity, the interior fitted with a holed false bottom, about 9 inches from the base. Set in brickwork (although this is not absolutely necessary) with a fire retort under it. A funnel about a foot in diameter at its greatest extent, with a rim to enter and a flange to support it, is fitted like a saucepan lid over a corresponding hole in the head of the tank. A pipe 2 inches in diameter—a continuation of the funnel—continues like a spiral worm around the interior woodwork of a barrel filled with cold water, the end projecting near the base like a faucet. This completes the apparatus. A five-gallon still can be constructed for about \$25 (about £5).

How to Operate the Still.—The space below the false bottom of the still is occupied by water, in which a few pounds of salt or alum are dissolved to increase the boiling point. The tank is now filled with the desired flowers, and the funnel-shaped lid is held in place by being screwed down and the joint packed with moist clay. A quick fire is lighted under the still, causing vapour, which, percolating through the flowers lying over the false bottom, releases the attar, and steam and oil go jointly up the funnel, and wind their way through the condensing corkscrew pipe. A stream of cold water running into the tub condenses the steam and oil, which flows into a glass jug placed at the lower end of the tube. The oil is seen floating on the top, and is skimmed off with a spatula or flat ivory paper-knife, or can be sucked off with a pipette (glass pipe), a crystal tube having a bulb about three inches from one extremity. The distiller places one end in his mouth, and, lightly touching the filaments of essential oil with the other, draws them into the bulb.

If the same distilled water is employed several times over, it increases the output of oil. The temperature of the steam must not be too great, or the essential oil is likely to be injured. Time—about three hours. The false bottom containing the stewed leaves is hoisted out, and the mashed mass is useful as a fertiliser. This process applies only to the rose. (Persons who are desirous of using stills will do well to study the law on the subject as it relates to Queensland. Heavy penalties are imposed on those who possess or work unlicensed stills.—Ed. *Q.A.J.*)

Attar of Roses.—Nature has many flowers. Gold is heavy, roses are not; yet the essential oil of roses is worth more than gold, weight for weight. Of all botanical growths, the attar or otto of roses finds the readiest market. It is always in demand. In a fairly prosperous year 300 lb. weight of roses will yield 1 oz. of attar, or oil, and a quantity of fragrant saleable rosewater. The correct kinds of roses to grow are the Centifolia and the Rose of France (Rose de Grasse). An acre of land under first-class cultivation will yield at least 1,500 lb. of rose petals, and this will give 5 oz. of attar worth from \$9 to \$13 (£1 16s. to £2 12s.) per oz., and there will be some 300 gallons of rosewater valued at from 75 cents to \$1 (3s. 1½d. to 4s. 1d.) per gallon.

An acre of lavender on good soil will require about 5,000 plants. The third year every 100 plants will average 1 lb. of oil, thus giving an average of 50 lb. of oil, worth \$2.50 (10s. 5d.) per lb.; cost of working is about £5 per acre. This will leave a profit of some £20 per acre. Over 1,000 tons of Rose de Grasse (the only rose of any commercial value) are grown annually at Grasse in France, and this enormous quantity is still not sufficient to meet the demands of the foreign markets. The treatment of this rose is so simple and expeditious that, when properly known and understood, thousands of acres of ground will be cultivated with this beautiful species of the rose family.

With respect to those who want to go into the business and want an immediate return, they should grow mignonette in large quantities, violets, tuberose, jonquils, boronia, &c. These can be treated the same year by the simple processes of extraction with fat as above described, and meantime they can be propagating lavender, roses, geraniums, which take more than one season to provide material for.

HINTS.

Never grow plots of flowers too close to each other. If you group several various kinds of scent plants too near together—as lavender here, pennyroyal next door—each will become tainted one with the other, and the virgin aroma of each will be confused. An acre of roses or jasmine should be separated by an acre of potatoes or cabbage.

The plants should be planted in rows running north and south, so as to get the greatest benefit from the sunshine. On the influence of the sun depends largely the superiority of the oil extracted.

WILL THE INDUSTRY PAY?

With Mr. G. M. Stratton, the writer of the preceding article, we say:—It is hard to tell, as so many scents are manufactured by chemical combinations. The violet, heliotrope, lilac, and many others are manufactured by chemicals so perfectly that none but experts can tell the difference between the true or the spurious article. Some exquisite scents are said to be prepared from the drainage of cow-houses! As an adjunct to ordinary orchard or farm business, scent-making will, however, always provide a nice little sum of pocket-money for young members of the family. A few pounds of fat and a few sheets of glass are all the appliances required, and these are cheap enough in Queensland. The rest is only light and pleasing work, only taking up a very short part of the early morning hours. The saturated lard is worth from £1 5s. to £1 10s. per lb. in London or Paris, and the spirit, which in the article we quote is called “extract,” is worth 3s. 6d. per oz. or £3 10s. per pint.

Tropical Industries.

PICKING COFFEE.

ON this subject Mr. E. Cowley says:—"People will run away with notions favourable to their own desires. No man or boy could average throughout the coffee season more than 50 lb. of berries per day. If he did that, he would have to work early and late. Boys will pick coffee for $\frac{1}{2}$ d. per lb. when there are plenty on the trees; but in the earlier and later pickings they do not care about the work, and it is quite unreasonable to think that boys will be obtainable for numbers of large plantations. They would be wanted in a dozen localities at the same time; also, do not the youth of Queensland require the midwinter holidays? Coffee-picking occurs right in the holiday season, and Australian boys would very properly object to work during their holiday time.* There are, of course, always a few worthless loafers who would go in for it, and the needy parents of others would compel their children to work. Ninety pounds may be considered a maximum picking for an adult (when there is abundance of fruit) in a day of nine hours, but he will dwindle down to 30 lb. in nine hours before the season is over. It is a case in point where the most unintelligent labour, valueless for any other purpose, can be employed on an equal footing with the most intelligent and valuable, provided the digits be there and the overseeing capable."

It will be self-evident that a picker, who is paid by weight at the rate of $\frac{1}{2}$ d. per lb., would not be able to make wages towards the end of the season; but as the bulk, say one-half of the crop, comes off at the first picking, the difficulty might be met by paying $\frac{1}{2}$ d. per lb. for the first picking, $\frac{3}{4}$ d. per lb. for the second, and 1d. per lb. for the third.

* On this point we differ with Mr. Cowley. Cotton-picking used to be in full swing during holiday time, and we have seen troops of boys and girls at work in the fields. The real holiday time of most hardworking farmers' children is when they are attending school—five hours' school work, the rest play.

COFFEE AT LANDSBOROUGH.

THE success which has attended the cultivation of coffee at the Buderim Mountain has at different times induced selectors on the Blackall Range to start the industry in a small way, and these experiments have shown that the soil and climate in certain localities in the district are eminently suitable to the coffee plant. Two or three years ago a company was formed in Brisbane for the purpose of growing coffee on a large scale about twelve miles from Landsborough, on the North Coast line, and some 40,000 coffee plants were raised, and a few acres were planted out. The method adopted by the manager, Mr. Waldegrave Thompson, who had gained his experience in Ceylon, was to brush the scrub, burning off all undergrowth up to 6 inches in diameter, and leaving the large trees standing to serve as shade. The experiment for various reasons proved a failure, and when the plantation was purchased twelve months ago by Mr. W. Bartlett the whole of the plants had died off owing to neglect.

Mr. Bartlett set to work energetically to reform the plantation and nurseries. He found the nursery established on a flat beneath a ridge, subject to the washing-down of soil during heavy rains. He abandoned this spot, and located the seed beds and nurseries 60 feet higher up the bank, and close-paled

it all round, surmounting the posts with a barbed-wire fence. He obtained some 500 plants of good varieties of coffee from the Department of Agriculture, and set them out in a nursery 80 feet long and 50 feet wide. He next planted out some 200 of the largest of these trees 9 feet apart, and they are now growing vigorously. Two thousand five hundred plants raised from seed have been planted in the nursery at a distance of 6 inches by 3 inches, and these will be ready to be transferred to the permanent plantation next season. In addition to these there are 20,000 plants of Arabian and Liberian coffee, all looking healthy and vigorous. Some seeds of fine Mocha were obtained from the Agricultural Department about three months ago, and they have outstripped all the other seedlings so far. Mr. Bartlett finds that the local seed is far before that received from Cairns. The latter seems to do better in the hotter Northern climate than in the comparatively cool climate of the South, whilst the former exhibits a far more vigorous growth. The best seed of all is that obtained through the Department from Mr. Grieve at Broadwater.

In clearing the land, all the timber except the native plum-trees is burned off, the plum-trees being left standing about 30 feet apart to afford the necessary shade. The standing scrub on the boundaries of the estate breaks the force of the winds. Belts of scrub will be preserved at intervals of chains, and as a further protection rows of olive-trees will be planted. Of these thirty are already planted out, and 100 truncheons are, with the exception of three or four, giving promise of healthy trees. Mr. Bartlett says the Blackall Range is undoubtedly the home of the olive-tree. Two rows of coffee plants will be planted between the olives this season. Coffee will also be planted between fruit trees on a 3-acre orchard which has been cleared some eight years ago. Frost is not to be feared here, the thermometer in winter ranging 15° F. higher than on the site of the original nursery. The land faces the south-east, with a gentle slope towards Ubi Ubi Creek, which is always running. In addition to the main crop of coffee and olives, there are plots of arrowroot, sugar, maize, and lucerne, whilst in the orchard may be seen bananas, apples, oranges, loquats, pears, and a large bed of splendid rhubarb. The Giant Tomato has also been planted. The cultivation is fenced in with 14-gauge 36-inch wire-netting, with a barbed wire 9 inches above the netting to keep out the marsupials. The whole of this work has been accomplished in twelve months, and it is anticipated that three years will see the estate self-supporting.

COFFEE CULTIVATION IN BRAZIL.

ACCORDING to a report furnished to the Minister of Foreign Relations of France, by M. Viener, the largest coffee-planting region is found between the latitudes of 18° S. and 25° S., but it extends much further north, and coffee-raising is carried on in an immense territory, embracing 25° of latitude and 24° of longitude (about 2,000,000 square miles). In the beginning of the century, Brazil exported only a very small quantity of coffee, but now it is the principal coffee-producing country of the world. The following statement shows the increase of the Brazilian coffee trade since 1800 from the ports of Rio and Santos alone, in bags of 60 kilogrammes (133 lb.):—

Year.						Bags.
1800	...	...	...	...	...	13
1817	...	..	...	...	...	66,985
1820	...	...	...	...	...	97,489
1830	...	...	...	...	...	484,222
1840	1...	...	...	...	...	1,037,981
1876	...	...	...	...	...	3,765,122
1895	...	...	...	...	...	6,508,768

In 1895, the crop was estimated at 7,000,000 bags; in 1896 it was even larger.

The coffee plant is not indigenous to Brazil, but it is to-day completely acclimated. One finds, it is true, in the forests of Bonucato (State of San Paulo) a so-called wild coffee plant (*Coffea amarello*), but they are without doubt plants that have come up from seeds carried by birds or monkeys. The cultivated variety is called in the country *Coffea vermelho*. The height of the tree varies from 2 to 5 metres ($6\frac{1}{2}$ feet to $16\frac{2}{3}$ feet), and the stem measures from 40 to 70 centimetres ($15\frac{3}{5}$ inches to $27\frac{3}{10}$ inches) in circumference. The processes of cultivation vary according to the locality. Thus, in the province of Ceara, according to a pamphlet by Mr. Job, quoted from by Mr. Viener, the coffee plant is always started in green-houses. The roots are transplanted at the age of two years, preferably from January to April, and are planted at a distance of from 10 to 12 palmos (the palmo is equivalent to about 9 inches). They begin to yield at four or five years. The season for gathering the crop is not always the same; on the other hand, it has quite a long duration, varying somewhat according to the heaviness of the rainy season, which generally begins in May or June and ends in August.

The beans are placed on a paved floor (uncovered), called in the country *fachine*, and the drying lasts from thirty to thirty-five days. In the State of Ceara, the old system of decortication, by grinding by millstones (*rodieros*) turning in a stone trough, is still employed. This method leaves much to be desired, for many of the grains are crushed by the weight of the stones. The cleaning and burnishing are done usually by hand.

In the States of San Paulo and Minas Geraes, the cultivation of coffee occupies vast areas, and the treatment of the coffee after the crop has been gathered is done in a much more perfect manner than in Ceara by the most improved machinery.

The largest *fazenda* (plantation) in Brazil, and perhaps in the world, is the Dumont plantation (State of Minas Geraes) established by a Frenchman, whose name the plantation still bears. The total extent of the property is 30,000 hectares (74,133 acres), 6,150 of which (15,197 acres) are planted in coffee. The number of plants in 1896 was 4,718,000 (or about 310 trees per acre).

The cultivation is carried on by Italian emigrants, of whom there are 8,000 employed. Each year the extent of this plantation grows, and the production becomes larger and larger.

In 1895 the yield from the Dumont *fazenda* alone amounted to 4,100,000 kilogrammes (about 4,035 tons, equivalent to 594 lb. per acre). The crop of 1896 rose to 4,500,000 kilogrammes (4,429 tons).

This plantation was sold three years ago to a Brazilian company for the sum of 12,000,000 francs (£500,000).—*Tropical Agriculturist*, Colombo.

As to the planter's life in Brazil, *Planting Opinion* says, referring to Mr. T. L. Villiers, a Ceylon planter who recently went to Brazil as manager of the Dumont Coffee Company's estates there:—Mr. Villiers went with Mrs. Villiers to the estate, but found the life there rougher than he anticipated and very different to a planter's life in Ceylon. The heat, he says, was very trying, almost as bad as Colombo, and yellow fever was very prevalent in the neighbourhood, so that he managed to get his agreement with the company cancelled, and left Brazil after a very brief stay. His description of planting life in Brazil is very interesting. There are very few English in the country, and they are not popular with the indigenous population. There was a European family on the Dumont Company's property—the secretary and his wife—but the nearest European doctor was a sixteen-hours' railway journey away, and the labourer is Italian, with little in common either with the coolie or the planter. The little narrow-gauge railway that traverses the San Paulo district

is the principal means of communication, but there is an accident on it nearly every day, so that, while it is useful for freight, passengers prefer to go round to Rio by sea, as being slower but safer. Brazil coffee-growing may be profitable, but is evidently not an occupation for a married Ceylon planter or for anybody who is not prepared to rough it a good deal.

In marked contrast to the above is the life of the planter in Queensland. Here we have all the requisites for successful coffee-growing combined with a salubrious climate, although a warm one in the North. Here the planter is in the midst of British civilisation, surrounded by his own countrymen, and protected by British law. He has the greatest facilities for communication both by railway—on which accidents, and those only trivial, are rarely heard of—and by three or four fleets of magnificent steamers which call in at every port on the coast two or three times a week. As to health, there is very little sickness, even in the most Northern coffee districts, whilst doctors are settled in every small centre of population. In most of the towns there is a good hospital, and not only the necessities of life but also all the luxuries of large cities can be obtained at not much greater cost than in the oldest cities of Australia. Yellow fever or any other epidemic disease is unknown, except when the rare and rarely fatal dengue fever makes its appearance, say once in about thirty years. The fact that European women and children live in the sugar and coffee districts from year's end to year's end, without suffering from heat or malaria is sufficient evidence of the salubrity of the climate and of the comfort of living. As to the profit to be derived from the cultivation of coffee in Queensland, a perusal of our articles on the subject in the *Journal* will amply demonstrate that larger yields are obtained here per tree than in any other coffee-producing country. We have just been informed on reliable authority that 7 lb. of clean coffee per tree has been obtained this season from trees on a plantation at the Buderim Mountain, about fifty miles from Brisbane.

Thus there is everything in the planter's favour in Queensland. All that is required is capital to enter into the industry on a large scale.

RAMIE FIBRE EXPERIMENTS IN NEW SOUTH WALES.

FROM the *Sydney Daily Telegraph* we learn that a sample of decorticated fibre from the ramie or rhea plant, grown at the Wollongbar Experiment Farm on the Richmond River, is now on view at the office of the Minister for Mines and Agriculture. Mr. Sydney Smith, some time ago, sent a bundle of ramie "ribbons," as the stalks of the plant in their undecorticated condition are called, but with a certain amount of preparation to permit of their working, to the Agent-General in England. His object was that the utility and value of the ribbons might be properly tested. The returned samples, with a report from the Agent-General, have been received. The report includes observations of experts on the samples of rough ribbons submitted. They were treated by the Rhea Fibre Treatment Company, Limited, of London, and a sample of "filasse," as the fibre when separated from the stalk and deprived of its gum is termed, has been returned. The sample was treated by the Gomess process.

From one of the accompanying letters from the Rhea Company, the following quotation is made:—My foreman . . . considers the ribbon excellent, and far superior to the rubbish that has hitherto been on the market. The ribbons will work well, as the fibre is good and strips well generally. Can you make me an offer to supply? Why not start the industry in New South Wales? We would make good terms for our patents. Another letter states:—We can use any quantity of it, value about £14 per ton; but it won't keep this figure; our decorticator would cheapen it and improve the condition. I would recommend you to indent patents and filasse it in the colony, and send home the filasse, which would be better. A third letter runs as follows:—I have

pleasure in sending you the result of your rhea ribbon. It is very good and very promising. If you would like to send me some more to this address I will get it filassed and gummed. Although the fibre is yet young, it will work well, I think. I hope you will not let the ramie question drop; evidently there is a big future for it in your colony.

At Wollongbar there is about an acre and a-half of ramie.

In the Technological Museum attached to the Department of Agriculture of Queensland there are some excellent samples of ramie fibre, and also samples of the various fabrics made from it. Some of these are quite undistinguishable from silk plush. They are dyed of various colours, and beautiful designs are worked into them. Like jute, the fibre lends itself to the manufacture of coarse canvas, and to that of finer fabrics, which appear as if made from silk. The Department has plants for distribution, and it is yet within the bounds of probability that the production of ramie fibre may make progress in Queensland. The great trouble in connection with it has always been the degumming of the filasse. We have hopes, however, that the process invented by Mr. Faure will overcome the difficulty, and in that case there need be no hesitation in growing a crop which is admirably suited both to the tropical and temperate districts of the colony. We refer our readers to previous articles on ramie which have appeared in this *Journal*, and which give full instructions for planting, cutting, treatment, &c.

RAMIE FIBRE.

IN the course of an interview with Mr. Kershaw, who is visiting the colonies with a view to opening up a trade in certain cotton thread fabrics, of which he is an extensive manufacturer in Manchester, the subject of fibre plants other than cotton was introduced. With regard to cotton, Mr. Kershaw said that it certainly would not pay to grow cotton in Australia for shipment to the home markets. The American grower got from 4 to 4½ cents (2d. to 2¼d.) per lb. for his cotton. But it was not so much the fibre that paid the farmer as the by-products, such as cotton-seed oil, oil cake, &c. These were worth more than the cotton itself. Speaking of other fibres, he said he did not profess to be an expert in Sisal hemp, but the demand for it was very great—in fact, almost unlimited. The quotation in the home markets of £40 per ton, he said, should yield a very handsome profit even if the working expenses and charges amounted to 50 per cent. If 1 ton. of clean hemp is obtained per acre, then, at even £12 per ton, it should pay well. On the subject of jute and ramie, Mr. Kershaw was more emphatic. There is absolutely no limit, he said, to the market for ramie fibre. It was in every way superior to jute, and whilst the finer silk-like fabrics of jute, can be distinguished from pure silk, it is almost impossible to do so in the case of ramie fabrics. As to the price quoted—£30 per ton for clean fibre—that was absurd. £30 per ton meant about 3¼d. per lb.; whilst the fibre commanded at least 6d. per lb. in the open market, or £56 per ton. The improved machinery would even have the effect of increasing the price. Ramie was a fibre which lent itself to the most delicate fabrics, as well as to the coarser ones. From his knowledge of the trade, and from what he had learnt whilst in the colonies on the subject of the adaptability of the soil and climate of New South Wales and Queensland to the cultivation of the plant, he came to the conclusion that it was eminently worthy of attention.

Entomology.

THE DISSEMINATION OF YEASTS BY INSECTS.

THE part played by insects in the distribution of minute vegetable organisms has been made the subject of an interesting investigation by Dr. Amedeo Berlese at the Portici Laboratory for Agricultural Chemistry. That they do perform this task, often a very mischievous one, has long been known; but the Professor, as is shown in the current number of *Nature*, has proved that, for good or evil, they are more active than had been hitherto ascertained. Ants were the subjects of his first experiments. He had frequently detected the cells of two alcoholic yeasts hidden in fissures of the bark on the trunks of both fruit and forest trees. These he suspected to have been transported by the ants, which were constantly travelling up and down the trunks, and it seemed likely that flies might co-operate in the work. First he "put the question" to the ants. He collected a large number of a species which is very common in vineyards. They were allowed access to bunches of grapes which had been carefully sterilised, and afterwards placed under conditions that prevented the possibility of any introduction of moulds or yeasts from the outer air. The result, in less than a fortnight, was that all the bunches which the ants could visit were abundantly infested with yeasts and moulds; while several others which had been preserved, even for a much longer time, in sterilised vessels from which the ants were excluded, had neither moulds nor yeasts nor bacteria on their surfaces. Dr. Berlese then turned his attention to the flies. His methods of inquisition, we fear, would not be approved by those who share Corporal Toby's view, and are merciful even to the house fly and the blue-bottle. In fact, these torments of the human race must have had a decidedly bad time in the laboratory. The first experiment, however, was simple and humane. A number of bits of sterilised meat were set out on a terrace, some of them covered by wire gauze, others accessible to the flies. After two hours' exposure to them and thirteen to the air, yeasts were found to be much more abundant in the former; indeed, Dr. Berlese estimates that the quantity of yeasts conveyed by flies is about twenty-six times as great as is brought by the air. Similar experiments were made with grapes, and with similar results. The next point to settle was the precise way in which the transport was effected. It was first ascertained that ferments were often more frequent in the bodies of flies than on their legs and feet; next, cells similar to those of yeast were detected in their excreta. It remained, then, to study the passage of these cells through the digestive apparatus of the insect. Common blue-bottles, or meat flies, were selected for this purpose, and a large number of experiments were made on them; but some other flies and cellar-midges were also tested. It was proved in all cases that when the flies were fed with sterilised material the excreta contained no yeasts; but when they had a diet of pure cultures of sundry yeasts, the excreta soon contained in great quantities the yeasts that were in the food. These cells also were not dead, but living. If collected, they duly germinated and developed, though the rate of the process and the abundance of the result were found to depend to a considerable extent on the temperature maintained. Further experiments indicated that the cells increased in number in passing through the body of the fly, and the general result of the whole series was to demonstrate that ants and certain flies play an important part, not only in the distribution (as was already known), but also in the preservation and multiplication, of alcoholic ferments. Insects, in fact, contribute far more than atmospheric air to the dissemination of yeasts, which are conveyed internally rather than externally. In some cases this distributing agency may be exercised for good, but we suspect it is far more often potent for evil.—*Standard*.

Pisciculture.

THE GIANT PERCH.

Mr. McILWRAITH, editor of the Rockhampton *Bulletin*, sends us the following:—In the *Queensland Journal of Agriculture* for January, Mr. D. O'Connor writes about the giant perch, or, as we are accustomed to call it here in Central Queensland, the barramundi. The name by which the fish is known in Mackay is the palmer, and Mr. O'Connor proposes it should be generally adopted. From this we dissent. Mr. O'Connor gives no reason for the change, which requires explanation. Besides, giant perch is appropriate and perfectly intelligible. "Barramundi," the blackfellows' term, is also suitable and acceptable as a common name. Mr. O'Connor also suggests an endeavour should be made to introduce the fish into the Brisbane River. To that there can be no objection, but in the meantime it may be well to consider—Why is the barramundi not there already? Here, it may be noted, there are two fish known as barramundi in Central Queensland waters. What is regarded as the true barramundi is to be found only in the Dawson River, and is recognisable by a brown spot on each of its large scales. The more common barramundi or giant perch is found in the sea, in the Fitzroy and its tributaries, and in lagoons filled by their waters in flood times. Fish weighing 50 lb. are taken in the traps at Emu Park, and with lines off Port Alma wharf. They are also caught far above the level of the highest tides in the Fitzroy and its tributaries, and in freshwater lagoons. Our opinion is that this giant perch is the analogue, and corresponds to the salmon in northern seas and rivers. Physiologically the salmon and perch are closely related. Shortly before this rainy season set in, the fishermen at Emu Park were rejoiced by the appearance of barramundi in their traps. That these are mature breeding fish may be assumed from their size, but they do not contain milt or roe, as the salmon does; at least, observers have failed to notice spawn. These fish, it is surmised, go up the river when in flood, find their way into creeks and lagoons, spawn there and return to the sea. Many of them are landlocked in lagoons by the rapid subsidence of flood waters, and are afterwards caught with rod and line. They have been taken between 30 lb. and 40 lb. weight in the lagoons near Rockhampton. At present the Fitzroy is rising, and the creeks and lagoons are full of water. A couple of months hence the outlets of the latter will swarm with what must be regarded as barramundi smolts making their way to the sea. A few years ago the writer caught with the rod four dozen in one day, using shrimps as bait; they ranged from $\frac{1}{2}$ lb. to $1\frac{1}{2}$ lb. in weight. These little barramundi have been observed in the Fitzroy many miles above Yaamba, but only after floods. There is a lack of precise and exact information regarding the habits of the fish, which it is desirable should be remedied. As the barramundi is a sea fish at certain seasons, and, like the crocodile, has not gone out of the tropics, it is to be feared attempts to introduce it into the Brisbane River would be attended with failure.

Forestry.

FOREST CONSERVANCY.

By A. J. BOYD,
Queensland Agricultural Department.

PART 3.

So far as our forests are concerned, it appears to me that the most feasible method of reproduction is yet to trust to Nature to aid her efforts.

We all know that the *Eucalyptus* family produces abundant seed. This falls on the ground, and a considerable portion of it germinates. I have seen a dense growth of young blue gum growing up after I had felled several large trees covered with seed. These saplings choked each other, and, had I required timber to grow, it would have been necessary to thin them out. If such work be done judiciously, room will be given to the remaining trees to arrive at a size when they may be utilised.

One of the reasons for the dense growth of these gums I take to be that the old trees, when in full seed, were felled upon freshly burnt-off scrub land. The ground was covered with a layer of ashes, and I have observed that wherever the seed falls upon ashes it germinates much more freely than if it fell upon the bare ground. The scrub at Oxley Creek, where this occurred, was very heavy, and consequently the ashes were in considerable quantity. If this fact be generally noticeable, it should be of much value to those who have any intention of forming nurseries of young trees.

As, then, Nature appears to be only too willing to repair the ravages of man, it would appear to be superfluous to undertake the planting of trees—that is to say, forming artificial plantations—and only necessary to assist her by protecting young trees naturally sown. But the expense of doing so thoroughly would, I believe, be found to be quite as great as and far more laborious than forming new plantations.

It would entail, firstly, the burning off of the vast masses of heads and useless butts left by the timber-getters, splitters, fencers, &c.—a labour in itself so great as only to be appreciated by actual visitation of a once heavily timbered scrub or forest which has been laid under contribution by those tireless workers.

To compel the latter or the saw-mill proprietor to burn off the tree-heads, especially of beech and cedar, would be handicapping them to such an extent that it would pay them better to import timber from Puget Sound, Vancouver, than to utilise our own resources. Furthermore, when the young seedlings become tolerably vigorous, they would require thinning out. If we consider the performance of this operation over a moderate timber reserve of, say, 10,000 acres, it will be easy to see that a considerable amount of labour and heavy expense would be necessary. The operations of Nature, then, can only partially be aided in the manner described. But, even without these operations, the proclaiming of certain areas as closed for a term of years and of others as open must operate most beneficially in preserving a supply of timber for future use, always provided that a Crown ranger be on the spot to supervise and control the work, and whose whole and sole duty should be the surveillance of the reserve under his care.

The next means we have of reproducing our timber is by planting young trees. This is the method now resorted to, in conjunction with those mentioned by the Department of Agriculture, notably on Fraser's Island, where many thousands of young trees, principally pine, beech, and silky oak, have been planted out in lanes cut through the scrubs. These planted lanes have an aggregate length of fifty miles, and the trees thrive remarkably well. Besides planting out, the naturally growing saplings are cared for and guarded



TARRIETIA ARGYRODENDRON. STAVE-WOOD.

against bush fires and falling trees. There are many other trees in the scrubs which might well be the objects of care as well as the soft woods; such are crow's ash, tulip-wood, *lignum vitæ*, rosewood, brigalow, penda, all of value to the cabinet-maker, shipbuilder, and carpenter.

The planting out of these nurselings is not a matter of excessive expenditure, considering the value of the work to future generations; and although posterity can do nothing for us but bless our foresight, it is our bounden duty to do something for posterity. Where would England's supply of the "brave old oak" have been, when wooden ships were in vogue, had it not been for the old stringent forest laws? I am not at all clear that the first William was so very much in the wrong when he created the New Forest (although it may not have been a forest in the present acceptation of the term). He may have interfered with local interests to a certain extent, but, at all events, he gave to posterity an area of ninety miles in circumference for forest purposes.

It is not my province to suggest how State forests should be managed. That part of the subject has been ably set forth in the reports of the Under Secretary for Agriculture, and in those of experts in forest conservancy. There remains, however, one phase of this important timber question which may be considered. I refer to the export of Queensland timbers, and particularly to the export of cedar. As already stated, our Northern scrubs have been and are still being denuded of cedar for the exclusive benefit of the southern colonies. Millions of feet of this class of timber have been and are being exported from the Northern rivers to Sydney and Melbourne. All that Queensland gains by this export trade is the price of the timber-getter's licenses, and the port and harbour dues of the vessels employed in it. For the rest, the log is admitted duty free into the southern colonies, whilst in some of them an import duty is imposed on sawn timber and joinery. Thus, the capital of the colony is being drained away without any *quid pro quo*.

There are still large areas covered with cedar, beech, and pine which have not yet been touched, owing to their distance from port; and, again, there are thousands of feet of cedar lying heaped up on the roadsides in the Cairns district awaiting either sale, transport, or a bush fire.

During 1879 the quantities and value of cedar and pine exported from the colony were:—

				Feet.		Value.
Cedar	...	...	...	4,531,341	...	£40,141
Pine	...	...	...	3,997,704	...	23,421
Total						£63,562*

The inference from this is that Queensland, by a judicious attention to the conservation and reproduction of her forests, could in that year have drawn £63,562 per annum from the southern colonies in payment of timber which would be constantly ready for market, provided attention were paid to forestry.

What is the cost of planting an acre of cedar or pine? My experience is that it can be done for £5, exclusive of the raising of seedling trees.

In our scrubs, there is little danger of the young trees being damaged even by wallabies; hence the only fencing required would be one to safeguard the trees from wandering cattle, and even that would not be required in most scrubs. The young trees would require a little attention to ensure straight branchless butts during the early stages of their growth. If no trees were allowed to be cut for fifty years, the interest on £5 would amount to £25 in that time. Thus an acre of cedar-trees would have cost £30, plus the cost of caretaking for about two years, say £100.

The number of trees per acre at 20 feet apart would be 108. Now, say that each of these trees attained a diameter of 2 feet in fifty years, the quantity of timber contained in 108 trees would be 178,960 superficial feet. The cash value at present of cedar is about £1 per 100 feet, including cost of cutting; £1,789 would thus be the value of an acre of cedar-trees.

* Compare Exports of Timber for 1895-1896, page 156.

But there is no need to wait fifty years for this result. There are, as before said, millions of feet of cedar still standing, which, by judicious management, could be made to minister to the requirements of both the southern colonies and ourselves for all time, and young trees, growing naturally, could be fostered and others planted out year by year as a further contingent supply. Hitherto I have only spoken of soft timbers, but I may point out that shipments of other classes of timber have been made, notably a consignment to England by the “Lady Douglas” in 1879, the results of which are here given:—

		s.	d.	
Rosewood sold at	...	4	6	per cubic foot
Brigalow	„	3	9	„
Crow's Ash	„	1	3	„
„	„	1	9	„
Yellow-wood	„	1	3	„
Spotted Gum	„	1	6	„
Ironbark	„	1	9	„

This is surely evidence of the direct loss we have sustained in the destruction of our brigalow and rosewood scrubs. Every twenty-foot log of brigalow burnt by the farmer is actually worth in the London market at least £5 12s. 6d., and every rosewood log £6 15s.

I leave to others to calculate the cost of bringing the timber by rail to Brisbane, and of shipping it as dead weight home in the wool ships. They may then reckon the cost of burning it off; deduct this from the freight and commission, and see if there would not be a new line of industry worth carrying on. What myall is worth in the English market I cannot say, but I have seen several truckloads of that scented timber at the Roma-street railway station destined for the German market.

The exports to Europe and to the southern colonies of Queensland timber during 1895-1896 are in marked contrast to those of 1879. During the later period the exports were as follow:—

Description of Timber.				Exported to.				Feet. Sawn.	Feet. Logs.	Value.
Bean-tree	...	...	...	Victoria	...	...	...	..	27,573	£ 148
Cedar	...	...	}	New South Wales	...	...	...	...	4,482	2,114
				Victoria	...	...	...	...	312,591	
				South Australia...	...	...	...	...	2,938	
				Total	...	...	...	...	320,011	
Cedar	...	...	}	New South Wales	...	...	75,139	...	863	
				Victoria	...	...	14,913			
				South Australia...	...	...	10,000			
				New Guinea	...	...	620			
				Total	...	...	...			100,672
Gum	...	...	...	Victoria	...	...	...	1,488	6	
Myall	...	...	...	United Kingdom	...	...	...	1,332	462	
Pine	...	...	}	Victoria	...	...	...	...	991	4
				New South Wales	...	...	...	147,702	1,052	
				Victoria	...	...	780	...	220	
				South Australia...	...	...	5,015			
				New Guinea	...	...	8,180			
				New Britain	...	...	899			
								14,874		
Silky Oak	...	...	...	Victoria	...	...	...	41,650	191	
Silky Oak	...	...	...	Victoria	...	...	...	1,085	10	
Miscellaneous Timbers				...	...	...	...	31,546	338	
Totals				...	...	...	116,631	570,293	£5,408	

It may not be without interest to take a glance at the administration of the forests of the public domain in the United States, although the system there adopted is not suited to the conditions obtaining in Queensland.

In that part of the United States lying to the east of the Great Plains, the Government has practically disposed of all its surplus land.

In the States of the Cordillera Range, according to the Bulletin of the American Geographical Society, the situation is entirely different; the proportion still owned by the State being much larger, ranging from 49 per cent. in Washington to 95·3 per cent. in Nevada. In these States, the areas which have been alienated by the Government consist in the main of valley lands, which, as a rule, are not afforested. The forests of the Cordillera Range are principally found on the mountains and high plateaux, the valleys and plains being without forest covering.

The use and application of the word "forest" in this connection requires explanation. It is here applied only to timber of merchantable size, such timber as is suitable for saw logs. It does not include such as is only useful for firewood, fence rails, posts, &c. The influences which dominate this distribution of forest over the western country are of course climatic, and consist mainly in the rainfall; indeed, the rainfall map is a forest map. The heavy timber growth in the north-west accompanies the well-known heavy rainfall, and the presence of timber on the high mountains and plateaux accompanies the heavy rainfall on these ranges.

In those parts of the arid region which are now timbered, the amount of rainfall is barely sufficient to induce tree-growth, and if the timber were destroyed it is doubtful whether, with the present supply of moisture, it would ever restore itself without artificial encouragement. In the North-west and in the Eastern States, where the rainfall is ample for tree-growth, such growth restores itself promptly when the forests, either by burning or cutting, are destroyed; but such is not the case in the arid regions. If it is desirable, therefore, that forests be perpetuated in these regions, they must be protected.

Forests should be maintained chiefly to provide continuous local supplies of timber. Now, timber is too bulky and cheap a commodity to bear long carriage. For this reason, if for no other, the forests of the west should be protected from all sources of waste, and perpetuated if possible, while at the same time supplying local needs. The physical and climatic aspects of the forest are little known. The influence of rainfall, humidity, temperature, and the flow and regimen of streams have been widely discussed, but most of the discussion has been purely theoretical, and, as we have indicated, there is doubt whether forests have any appreciable climatic influence.

In Queensland we see vast stretches of magnificent grass country absolutely destitute of trees, where yet there is a copious annual rainfall. Again, we find barren, rocky hills with scarcely a vestige of herbage, yet studded thickly with trees of great height and girth, notably as seen in stringy bark country. In order to check the rapid destruction of timber in the far west of the United States, a Bill was passed in 1890, providing that the Government should own or hold in perpetuity certain lands designated as "forest lands," but there was no provision made for administering these lands or for regulating the cutting of timber on them.

Under this authority, the Presidents Harris and Cleveland had from time to time declared certain areas reserved, by proclamation, the whole of such reserves amounting then to some 17,500,000 acres; and in 1897, 20,000,000 more were reserved.

The following table will show the districts to which they belong—their number and area :—

District.	Number of Reserves.	Area in Acres.	Area in Square Miles.
<i>South Dakota</i> —(The Black Hill Reserve)	1	967,630	1,500
<i>Wyoming</i> —			
Big Horn	1	1,198,080	1,870
Yellowstone Park	1	1,168,640	1,826
Teton Reserve	1	829,440	1,300
<i>Montana</i> —			
Flat Head Reserve (in the North)	2	1,382,400	2,160
Lewis and Clark (in the South)	2	2,926,080	4,570
<i>Idaho</i> —			
Priest River Reserve	1	645,120	1,000
Bitter Root Reserve	1	4,147,200	6,480
<i>Washington</i> —			
The Washington Reserve	1	3,594,240	5,620
Olympic Reserve	1	2,188,800	3,420
Mount Rainier Reserve	1	2,234,880	3,510
<i>Oregon</i> —			
Bull Run and Cascade Reserve	2	4,700,000	
<i>California</i> —			
Stanislaus and Sierra Reserves with Yosemite and Sequoia National Park	4	6,144,000	9,600
San Gabriel and San Bernardino Reserve	2	1,152,000	1,800
San Jacinto Reserve	1	737,280	1,150
Trabuco Cañon Reserve*	1	64,000	100
<i>Utah</i> —			
The Uinta Reserve	1	960,000	1,500
<i>Arizona</i> —			
The Grand Cañon Reserve	1	1,851,520	29,105
<i>Colorado</i> —			
Pike's Peak, Plum Creek, S. Platte Reserve	3	1,308,800	2,045
White River Reserve (12,000 feet above sea level)... ..	1	1,280,000	2,000
Battlement Mesa Reserve (10,000 feet above sea level)	1	696,000	1,400
<i>New Mexico</i> —			
Pecos River Reserve	1	304,000	475

Collectively, these reserves comprise an area of 38,880,000 acres, or 60,000 square miles.

*The last four contain no timber except chapparal brush of no earthly use, except in regulating the flow of streams from the Santa Anna Mountains.

In considering these reserves, one is struck by a singular omission. The finest body of timber, excepting that in Oregon, Washington, and North California, is that upon the San Francisco and Mogollon Plateaux. Here is an open forest covering thousands of square miles, composed of magnificent trees, mainly Douglas pines. The forest grows in an arid range, and if destroyed could never recover itself. No part of those plateaux has been reserved.

The finest timber range of California is in the north sierra of the North Coast Ranges. Here are sugar-pines and redwoods, but nothing has been reserved.

On the other hand, as in the case of the San Bernardino and San Jacinto Mountain, reservations are made where there is absolutely no timber.

At one time it was proposed to abolish all these reservations, but eventually it was decided to make a survey of them, and organise a Forestry Bureau in the Department of the Interior for the purpose of administering the reserves, and this has now become law.

It may be seen from the tables given that the administration of such an enormous area of Forest Reserves, much of which is either located in inaccessible mountain country or is devoid of any but useless timber, would entail an enormous expense; and, as a matter of fact, the reserves are, except in a few instances, not administered at all.

General Notes.

THE VALUE OF IRRIGATION.

MUCH as has already been done in Queensland in the way of obtaining a water supply in the dry Western country by means of artesian wells, yet the work in that direction here is mere trifling compared with what has been done by the French in Algeria. In this colony bores are put with the object of securing a supply of water for stock during a dry season, or to enable waterless portions of a run to be utilised. In these localities there is a soil, and in good seasons plenty of grass. The one thing wanting—water—is supplied by these valuable bores. But, turning to North Africa, we find millions of acres without soil or grass or shrub. Only on scattered *oases*—some of which cover hundreds of square miles, others only affording nourishment to a few date palms growing round a natural spring—only on these spots are grass, water, and fuel to be found. All the rest is sand—sand that sometimes, under the influence of a deadly *samiel* or of a *sirocco*, is set in motion like the surface of the sea, and is often whirled into the air in the form of pillars of sand like waterspouts. We have seen the desert sand cloud moving along like the dense black smoke of a vast bush fire. Yet man's ingenuity triumphs over Nature in this inhospitable land.

In Algeria no fewer than 12,000,000 acres of barren sand of the Sahara Desert have been rendered fertile by enterprise representing, perhaps, the most remarkable example of irrigation by means of artesian wells which can be found anywhere in the world. Algeria owes to its method of cultivation that it has become a most important wine-producing country, as may be judged by the fact that the colony sent to France in 1886 10,500,000 gallons of wine. During the past ten years the irrigation area has been enormously increased, and a corresponding increase in agricultural operations has taken place. If such surprising results are obtained in a country such as the Sahara Desert, may we not confidently look forward to the time when millions of acres of the dry but not barren country of Western Queensland will be studded with cultivated homesteads due to the multiplication of artesian wells. The agricultural population of Algeria is about 3,500,000, of whom only some 200,000 are Europeans, yet in 1895 (to which date only the latest agricultural statistics are given) the area under wheat was 3,264,000 acres, yielding on an average in that year barely 8 bushels per acre. Barley is grown on a much more extensive scale. In 1895, 7,000,000 acres were devoted to this and other grain crops. There were in the colony at this time 1,121,246 cattle, 7,891,979 sheep, and 3,545,041 goats. Seven hundred thousand sheep were exported. The cultivation of the vine is rapidly increasing, and the good returns from the last three vintages have greatly improved the position of colonists. The future of Algeria, Mr. Consul-General Hay-Newton thinks, will centre in vine culture. Most vigorous and successful measures are adopted for the destruction of locusts.

COTTON CULTURE IN NEW SOUTH WALES.

MR. MUSSON, who is an enthusiast on the subject of cotton-growing, has been granted a lease for six months, at a rent of 5s., of half-an-acre of the land of the Sydney Water and Sewerage Board at Botany, to make experiments in cotton-growing. The experiment will, no doubt, be successful from a horticultural point of view. We have seen beautiful Sea Island cotton which was grown at Brisbane Water (New South Wales) in 1861. But, as to the commercial success of any extended area of cotton, we believe that there is

nothing in it. Success in cultivation is certain loss in exporting the clean product. Thousands of acres of cotton were grown in Queensland during the Civil War in America, the farmers raising two bales of clean cotton per acre. Nothing then paid so well as this crop, but to-day, for Australia, with high rates of wages, long sea voyage, and with all attendant charges, to attempt to compete with Egypt, India, the United States, Africa, and other countries, is futile. The last clean cotton shipped to England by the writer, in 1870 and 1871, brought 7 $\frac{3}{4}$ d. per lb., when previously the same class of cotton had averaged 1s. 0 $\frac{1}{2}$ d. per lb. The price of the seed cotton (3d. per lb.), the cost of ginning, baling, cartage, freight, commission, &c., effectually cleared away any profit, and left a loss.

DANGEROUS BUTTER FROM INDIA.

A CORRESPONDENT writing to the *Standard* mentions the danger likely to arise from Indian butter being admitted into England. He says:—A correspondent who formerly occupied an important official position in India informs me that a ton of butter made in Bombay has either reached, or will shortly reach, this country. He is of opinion that the authorities should be warned of the danger of allowing this butter to come into consumption, seeing that it was made in a city in which fever, cholera, and the plague are prevalent. The filthy habits of the petty Indian dairyman, he says, are notorious, and they would think nothing of keeping milk in their single room, even if it were occupied by a victim of one of the diseases named above. The reason of the exportation of butter from Bombay, which is quite unusual, is that the population of the city has been reduced 50 per cent. by deaths and the exodus of people flying from the danger of disease.

This is corroborated by another correspondent, who declares that no Anglo-Indian would ever dream of using native-made butter, taking into consideration its filthy manufacture. "Muccum" it is called in the vernacular, and the name is appropriate. During the whole tenure of his command in a well-known Indian service he never allowed it on board, either for the use of officers, engineers, or passengers—tinned butter only, which he made his butler, to render it more appetising, first wash in "condensed milk," place in the ice-chest, and serve up in pats, dressed with a little parsley and a few peppercorns, and many lady passengers often remarked "what delightful fresh butter he kept on board."

PROPERTIES OF APPLES.

THE *Bulletin of Pharmacy* says:—The apple is such a common fruit that few persons are familiar with its remarkable efficacious medicinal properties. Everybody ought to know that the best thing they can do is to eat apples just before retiring for the night. Persons uninitiated in the mysteries of the fruit are liable to throw up their hands in horror at the vision of dyspepsia which such a suggestion may summon up, but no harm may come even to a delicate system by the eating of ripe and juicy apples before going to bed. The apple is excellent brain food, because it has more phosphoric acid in easily digested shape than any other fruits. It excites the action of the liver, promotes sound and healthy sleep, and thoroughly disinfects the mouth. This is not all. The apple obviates indigestion, and is one of the best known preventives of disease of the throat.

AMERICAN BUTTER.

IN commenting upon the results of the third experimental shipment of butter from the United States to London, under the arrangements of the Secretary of Agriculture, the *Albany Country Gentleman* says that it cost 2 $\frac{1}{2}$ cents per lb. to convey the butter from Central Minnesota to London, where it was placed in the hands of retail dealers at 15 to 19 $\frac{1}{2}$ (7 $\frac{1}{2}$ d. to 9 $\frac{1}{4}$ d.) cents per lb., its value

in New York at the same time being 15 cents ($7\frac{1}{2}$ d.). As there must have been some London expenses, whether paid by the American Department or not, the average of the London prices did not equal the New York prices *plus* expenses. Some Massachusetts butter sent at the same time sold at half a cent ($\frac{1}{4}$ d.) per lb. less in London than it was worth in the district of its manufacture. It is further stated by the American journal that the Minnesota butter was retailed to London consumers at an average of 7 cents ($3\frac{1}{2}$ d.) more than its wholesale price, and that the Minnesota Creamery Company got only half what consumers paid, while the farmers who supplied the milk obtained no more than two-fifths.

AN INSECT FOE OF BEETS.

IMPORTERS of sugar-beet seed will not be pleased to learn, from *La Feuille des jeunes Naturalistes*, that an insect belonging to the order Curculionidæ (*Boris spoliata*, Bohem.) has commenced to attack the sugar-beet in Tunis. The insects destroy the bulbs by boring galleries through them, and the beets rot away, becoming a mere mass of corruption.

HOW TO CALCULATE INTEREST.

IT is often useful to know how to calculate simple interest without working out an intricate sum. The easiest method is to double the rate per cent., and multiply the principal by it. The answer, cutting off the last figure (which is tenths of a shilling), is then in shillings. For instance, suppose a person to have a loan of £250 at $7\frac{1}{2}$ per cent. The double of $7\frac{1}{2}$ equals 15. Then 250 multiplied by 15 gives 3,750. Cut off the nought; there remains 375 shillings, which is £18 15s., or the interest on £250 at $7\frac{1}{2}$ per cent. Again, 3 per cent. on £75 works out thus: $6 \times 75 = 450$. Cut off the last figure, and the result is 45s. = £2 5s., the interest.

PAWPAW JUICE.

THE pawpaw juice mentioned by Mr. J. F. Bailey in his article on the Pawpaw (*Queensland Agricultural Journal*, Vol. I., Part 3) as being worth 10s. per lb. in London, is now quoted at 5s. per lb., and is easily obtained from the unripe fruit. The *Chemist and Druggist* gives the following as the best method of preparing it:—The juice is pressed out of the fruit, clarified by filtration through a twill bag, and the ferment precipitated by alcohol. It is then dried, but is sometimes purified by treatment with water.

WEEVILS IN CORN.

PROFESSOR CHURCH says the only cheap and perfect application for the prevention of weevil upon corn and grains consists in the employment of bisulphide of carbon. The quantity required, provided the grain is kept in close vessels, is very minute—not more than $1\frac{1}{2}$ lb. to each ton of grain—so that 8d. is the cost of preserving a ton of wheat. The bisulphide leaves no disagreeable taste or smell behind, and the quality of the grain remains unimpaired. When bags are used, instead of iron cylinders, specially prepared for use in the bisulphide process, the protective influence of this chemical soon ceases, and a fresh application of the bisulphide must be made. In either case the liquid is applied as follows:—A ball of tow is tied to a stick of such a length that it can just be plunged into the middle of the vessel containing the grain. The tow receives the charge of bisulphide like a sponge, and is then *at once* plunged into the sack or cylinder, and left there, the mouth being closed tightly. When necessary, the stick may be withdrawn, and the charge (1 oz. bisulphide to 100 lb. grain) renewed.

Another Remedy.

Professor F. W. Cabanis, Assistant Director of Agriculture, Burma, writing on the destruction of the black weevil, says:—I have been trying for several years a number of experiments with the object of finding a cheap and simple method of preventing the ravages of this weevil. I think that I have found it in the use of naphthalene powder. . . . It is best to place the naphthalene at the bottom of the bin or bulk of grain. To accomplish this, take a bamboo about $1\frac{1}{2}$ inches in diameter and long enough to reach from the top to the bottom of the bulk of grain. Punch the joints out of the bamboo, so as to be able to pass a stick through from one end to the other. Have the stick made to fit the cavity in the bamboo. Pass the bamboo with the stick in it down through the bulk of grain from the top to the bottom. Withdraw the stick, and drop into the top of the bamboo about half-a-teaspoonful of naphthalene powder. The bamboo can then be drawn out, as the naphthalene is safe at the bottom of the bulk of grain. If the bulks are large, this should be done once to every 10 feet square of the bulk. Repeat the application every fifteen or twenty days, as the powder evaporates. The weevil that can leave the grain will do so, and those that cannot leave are killed by the odour of the naphthalene. I do not believe that naphthalene thus used can cause any injury whatever to the grain. For seed purposes the germinating powers appear not to be affected in the least. For marketable grain the colour is not affected, and the odour will leave in a short time if fresh naphthalene is not applied to it. The quantity of powder used is infinitely small in proportion to the quantity of grain, and the powder is entirely destroyed by evaporation, so that for food purposes the effect is *nil*. Naphthalene powder is worth about 3s. per oz.—*Tropical Agriculturist*.

INFLUENCE OF THE MOON.

IN an article on "Forestry," by D. E. Hutchins, F.R.M.S., in the *Agricultural Journal* of the Cape of Good Hope (11th November), Mr. Vederman, missionary of Genadendal, is reported as stating that the practice there is to cut cluster-pines all the year round, but always when the moon is down. On this point Mr. Vederman is emphatic, and says that he has amply proved by experience that wood felled when the moon is down is better to work, lasts better, and is less liable to get worm-eaten. We must still profess scepticism on the belief in the moon's influence. How far some enthusiasts will carry their pet theory is evidenced by an article in the *Australian Field* by Agar Zariel—a *nom de plume* apparently. This writer gives advice for November agricultural operations, most of which is solid sense, and which could be taken with advantage; but we fail to see why planting on the 3rd of the month should only be carried on from 3 to 4 p.m., and on the 4th and 5th from 5.30 to 7.15 a.m., 9.15 to 11 a.m., 1 to 3 p.m., and 5.15 to 6 p.m. Nor do we think that a busy farmer would till, weed, and harvest on only the 16th and 17th of the month, on the ground that the month is weak in special days for these operations, and that consequently only the *last quarter* of the moon—i.e., during the week before new moon—may be utilised. So far as we know, the only influence exerted by the moon on this planet is on the great waters, which are attracted by her, and rise immediately beneath her in the form of a high tide, which follows the moon in its course round the world. We are informed that many German farmers will not sow annuals, beans, peas, carrots, &c., &c., on a waning moon. They assert that if seeds are sown at new moon, up to full moon, the resulting crops are greatly increased. This would be very easy to prove, and we shall be glad to hear of the result of any experiments in this direction.

NITRAGIN.

THE *London Standard* says:—There is a little too much haste in some quarters to condemn "nitragin," the German preparation of nitrogen-accumulating organisms for leguminous crops, as useless because no benefit has been

manifest from its use in certain experiments in Scotland. No advantage whatever was derived from the use of the preparation in trials upon beans and clover, carried out for the Glasgow Technical College in the south-west of Scotland last season; but, apparently, the experiments were tried on land which grew good crops without any assistance, and presumably, therefore, were supplied with all the organisms needed. The only fair test is to apply the preparation upon "clover-sick" land, or soils too poor to grow beans, peas, or lentils properly. But Mr. J. R. Campbell, of the Harris Institute, Preston, records in the *Agricultural Gazette* some favourable results of the use of "nitragin" even on the good land of the Lancashire County Council Farm near that town. One captious argument against the possibility of any good being done by inoculating the soil with "nitragin" is that soils suited to the existence of the bacteria are sure to contain them in abundance; while they will not thrive in soils not suited to them. This is simply begging the question; and, if it were true, it would apply to the inoculation of land sterile for leguminous crops with small quantities of soil from fields in which such crops flourish; whereas such inoculation has given excellent results in a number of cases in Germany. The value of "nitragin" has not yet been sufficiently demonstrated; neither has it been disproved.

BUTTER RATIO OF MILK.

REFERENCE was recently made to the high butter ratios of milk in Australia, and it was stated that one example given was not by any means a "record." It appears that the best ratio hitherto made public in Victoria is 1 lb. of butter from a small fraction under 17 lb. of milk as the average result attained at the Wilburg Creamery, presumably for a period of six months, as accounts are made up and presented half-yearly. The Australian writer who chronicles this very remarkable achievement states that several examples of 1 lb. of butter having been obtained on the average from 18 lb. of milk have been given. It would be interesting to learn what was the average yield of milk for the cows which supplied the creameries. In British, Irish, American, or Canadian creameries 1 lb. of butter from 25 lb. of milk would be regarded as a very good ratio.—*Stock and Station Journal*.

CLOSING OF AN AGRICULTURAL COLLEGE.

FROM a telegram received last week from Victoria, we learn that the Longerenong Agricultural College and Experiment Farm near Horsham (Vic.) has been closed. The reason for this appears to be the want of water. Owing to the long-continued drought, it has been found impossible to continue agricultural operations, notwithstanding that a part of the land is watered by the channels of the Wimmera Water Trust. That corporation, however, is unable to supply water for irrigation purposes, and only the stock can benefit by its channels. There were thirteen students in residence, who will be sent to the Dookie Agricultural College. The college will probably be reopened when a sufficient water supply is again available.

WHAT IS A HOGGET?

Two graziers in a railway carriage are conversing upon market prospects, and one remarks that he expects to get a good figure for his hoggets. After leaving, one of the remaining occupants asks his neighbour, "What's a hogget?" "Well, I don't know exactly," was the reply, "but I think it has something to do with a pony when its mane is cropped." "Not at all," interjects the other, "a hogget is a young pig." A new passenger comes in, and it is resolved to leave it to him. "A hogget," sagely replies the newcomer, "well, you'll have to excuse me, gentlemen, because I really don't know anything at all about poultry."

AGRICULTURAL AND HORTICULTURAL SHOWS.

THE Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

SHOW FIXTURES.

Horticultural Society of Queensland, and the Queensland Fruitgrowers' Association ...	1st and 2nd February.
Central Downs Agricultural and Horticultural Association	2nd February.
Eastern Downs Agricultural and Horticultural Association (Warwick)	9th and 10th February.

Statistics.

THE following table will show the monthly export of butter from Queensland to ports outside of Australasia, under the provisions of the Meat and Dairy Produce Encouragement Act, during 1896:—

					Cwt.	qr.	lb.
January	...	...	...	...	1,273	0	0
February	...	...	...	...	8	3	20
October	...	...	...	...	236	2	0
November	...	...	...	...	1,635	3	20
December	...	...	...	...	888	2	0
Total					4,042	3	12
					Tons	cwt.	qr. lb.
Or ...	...	...	...	...	202	2	3 12

The Markets.

AVERAGE PRICES FOR DECEMBER.

Article.								DECEMBER.		
								Top Prices.		
								£	s.	d.
Bacon	...	...	...	...	...	...	lb.	0	0	7
Bran	...	...	...	...	...	...	ton	3	16	3
Butter, First	...	...	...	...	...	...	lb.	0	0	8 ¹ / ₆
Butter, Second	...	...	...	...	...	...	"	0	0	5 ² / ₃
Chaff, Mixed	...	...	...	...	...	...	ton	3	10	0
Chaff, Oaten	..	...	...	...	...	...	"	4	8	9
Chaff, Lucerne	...	...	...	...	...	...	"	2	14	4 ¹ / ₂
Chaff, Wheaten	...	...	...	...	...	...	"	2	18	9
Cheese	...	...	...	...	...	...	lb.	0	0	6
Flour	...	...	...	...	...	...	ton	15	0	0
Hay, Oaten	...	...	...	...	...	...	"	3	5	0
Hay, Lucerne	...	...	...	...	...	...	"	1	16	10 ¹ / ₂
Honey	...	...	...	...	...	...	lb.	0	0	1 ¹ / ₆
Japan Rice, Bond	...	...	...	...	...	...	ton	15	5	0
Maize	...	...	...	...	...	...	bus.	0	2	9 ¹ / ₄
Oats	...	...	...	...	...	...	"	0	3	8 ¹ / ₄
Pollard	...	...	...	...	...	...	ton	3	16	10 ¹ / ₂
Potatoes	...	...	...	...	...	...	"	5	0	0
Potatoes, Sweet	...	...	...	...	...	...	"	2	2	6
Pumpkins, Table	...	...	...	...	...	...	"	3	1	3
Sugar, White	...	...	...	...	...	...	"	15	12	6
Sugar, Yellow	...	...	...	...	...	...	"	13	2	6
Sugar, Ration	...	...	...	...	...	...	"	11	12	6
Wheat	...	...	...	...	...	...	bus.	0	4	6
Onions	...	...	...	...	...	...	cwt.	0	6	8 ¹ / ₄
Hams	...	...	...	...	...	...	lb.	0	0	9 ³ / ₈
Eggs	...	...	...	...	...	...	doz.	0	0	6 ¹ / ₆
Fowls	...	...	...	...	...	...	pair	0	3	10 ¹ / ₂
Geese	...	...	...	...	...	...	"	0	6	11 ¹ / ₄
Ducks, English	...	...	...	...	...	...	"	0	3	0 ³ / ₄
Ducks, Muscovy	...	...	...	...	...	...	"	0	4	5 ¹ / ₄
Turkeys, Hens	...	...	...	...	...	...	"	0	7	9
Turkeys, Gobblers	...	...	...	...	...	...	"	1	1	1 ¹ / ₂

Farm and Garden Notes for February.

Farm.—During this month plough up and prepare the land for a potato crop. Small potatoes are the best for this planting, for if large they have to be cut up in sizes, and the chances are they will rot. Deep ploughing is recommended. If you have rich deep soil, clear of weeds, sow lucerne; but if weeds are still making their appearance in consequence of hot, muggy, showery weather, then defer the sowing until the ground is perfectly clear. Panicum, Cape barley, sorghum, vetches, Kaffir corn, and imphee may be sown under similar conditions. Sow Swede turnips and mangel wurzel for early winter crop. Maize may still be sown, although, should frosts occur early in June, the ripening crop runs a risk of being damaged. Plant early potatoes, using bone-dust or short manure on the poorer soils.

Kitchen Garden.—All unoccupied land should be roughly dug, and, where required, add well-decomposed manure; the land not immediately required will benefit by exposure, and the remainder will be ready for sowing at the first showers. Transplant cabbage, cauliflower, celery, &c. Sow French beans, beet, carrot, turnips, radish, cabbage, cauliflower, cress, peas, mustard. Former sowings should be turned out and kept clear of weeds. Mulch round melon and cucumber beds with a good dressing of long stable manure, as it assists in keeping the fruit clean and free from dampness. Should the weather be very dry, and the plants appear to suffer, give them a good soaking of water; it is better to depend entirely on mulching than to give a mere sprinkling of water, more especially when plants are exposed to the sun at this season. Seeds of plants previously selected should be collected as they ripen, and before the pods are too brittle. Cucumbers, melons, French beans, and tomatoes should be looked for every day, and gathered whether they are required or not, for, if left on the vines or plants to perfect their seeds, the plants will soon cease to be productive or will form ill-shaped, inferior, unsaleable fruit.

Flower Garden.—The hot weather experienced at this season of the year, especially when following such an abnormally wet season as was experienced in the month of January, materially damages the appearance of the garden beds. Thin out and tie up dahlias. Keep the weeds down rigorously, never allowing them to seed. Rake all the borders, so that they may look neat and trim. This is the best month of the year for sowing all the hardy annuals. By judicious sowing now, a succession of bloom will be kept up during the succeeding months of autumn and winter. To ensure this, sow phlox, pansy, daisy, stock, aster, nasturtium, hollyhock, candytuft, mignonette, sweet peas, dianthus, carnations, cornflower, summer chrysanthemums, verbenas, petunias, penstamons, &c., &c. Dianthus sown now and planted out the next month will bloom during the whole year, if the dead flower-stalks are regularly cut away.

In sowing flower seeds, every care should be taken that they are not sown too deep, for on this depends greatly what results you will have as regards the seed germinating. A good plan to adopt in the sowing of seed is to cover the seed with fine soil the same depth as the seed is in size; for instance, take a pea, which is near enough to a quarter of an inch in size—this, to be properly sown, should be covered a quarter of an inch with soil.

Orchard Notes for February.

By ALBERT H. BENSON.

DURING this month there is no great output of Queensland-grown fruit, though there will still be a few pines and mangoes to market on the coast and grapes from the Downs and Roma districts also, as well as European plums, pears, apples, quinces, peaches, &c., from the Downs, especially the Stanthorpe district. Growers should take every care to send nothing to market unless it is sound, as diseased fruit is unsaleable, and its presence prevents the sale of sound local fruit. Large plums, such as the Yellow Magnum Bonum and Pond's Seedling, which do well in the colder districts, will pay for extra care in handling and packing, and the same applies to good peaches or pears. The plums should be carefully packed in shallow boxes, but the peaches should be wrapped in tissue paper and packed in single layers in trays fitting into well-ventilated crates, so that they can reach the market with the bloom on and without being bruised. For sound fruit in this condition there is a good sale, and it will pay growers to put such fruit on the market in the best manner possible. Chip baskets holding about 5 lb., and fitting into crates, as advised for grapes in the "Notes for January," are also excellent for marketing high-class plums or firm-fleshed peaches, but soft-fleshed peaches that bruise readily are best wrapped and packed in single layers in trays.

As the month is usually a more or less wet one, the cultivation of the Orchard is apt to become somewhat neglected, owing to the impossibility of getting horses on to the land and to the rapid growth made by weeds of all kinds.

However, whenever the land is dry enough, cultivators fitted with surface knives should be used to cut down the weeds, and when such are too strong to be treated in this manner they should be mown down before they mature their seeds, and the trash buried by a shallow ploughing. In the drier districts, however, the cultivator should be kept going to retain the moisture in the land, especially after a rain, when the sooner the surface can be stirred after the rain stops the more moisture will be retained. Where needing it, citrus trees should receive an irrigation during the month—not a mere sprinkling, but a thorough soaking—as it is much better to give the trees a good watering and be done with it than to be continually applying small quantities. Surface waterings induce the growth of surface roots, and this is a drawback in hot, dry districts.

Scale insects of all sorts attacking citrus or other evergreen trees should be systematically fought during the month by spraying or fumigation; and where spraying is used, it is advisable to use a poisonous spray that will destroy scale and leaf-eating insects at the same time.

The planting out of all tropical and semi-tropical fruits can be continued throughout the month during suitable weather—viz., dull or showery days. Mango seeds should be planted either in nursery or, where possible, where the tree is to be permanently located. Plant the seeds as soon as they are taken from the fruit, as if exposed to the air they rapidly dry out and lose their vitality. Don't plant seeds of any mangoes unless they are of extra quality and good bearers. There is far too much rubbish propagated for which there is no sale now; so if we don't want to increase this, only selected seeds of the best varieties should be planted.

Budding can be continued during the month, and the nursery will require constant care to keep it free from weeds, to see that all ties are cut, and, where necessary, that the buds are properly started and tied up, as, unless the young tree is properly started and trained to a single straight stem in the nursery, the grower has a difficult job to get it to grow into a decent tree when it is permanently planted out.

First plantings of strawberries for the production of early fruit can be made during the month. The land should be a rich loam, deeply worked and carefully prepared, and, where the same is available, should receive a good dressing of well-rotten farmyard manure, or, if this is not obtainable, then a dressing of 6 to 8 cwt. per acre of a mixture of Thomas' phosphate or superphosphate of lime or bones and sulphate of potash, in the proportion of 5 cwt. of phosphate to 1 cwt. of sulphate of potash. If possible, choose a piece of land that can be watered, and that is as free from frost as possible, as, if the winter and spring are dry, a supply of water for irrigation will be of the greatest assistance; and freedom from frost will secure early fruit. Obtain healthy runners, not old plants split up; and where the strawberry leaf blight is prevalent, remove and burn all old leaves on the runner, and dip the crown and remaining leaves, but not the roots, into Bordeaux Mixture to destroy the spores of the fungus causing this disease; and thus obtain healthy young plants to start with. Set the plants out in rows 3 feet apart and 1 foot apart in the row where the plot is to be worked by horse power, but where the labour is by hand 2 feet between the rows is sufficient. If the strawberries are to be irrigated, then the land must be graded level, and should be laid off in double rows, there being 4 feet between each double row, and 2 feet between the rows forming the double row.

The plants should be set on a slight ridge formed from the centre of the double row, which is thus lower than the plants, and forms a channel along which the water runs, and irrigates the plants on both sides of it.

The following are some of the best varieties of strawberries to plant:—Marguerite, Trollope's Victoria, and Pink's Prolific. Marguerite is early, and does well in fairly light loams, but is very subject to the leaf blight; still on account of its size and productiveness it pays to grow it, and keep it free from disease. Pink's Prolific is a very healthy high-coloured showy fruit—good bearer in rich volcanic loams. Trollope's Victoria requires a rich heavy loam to produce the best fruit, and when grown in such a soil it is a good bearer of large showy fruit. There are other varieties, such as the Captain, Edith, and Sharpless, that are worth testing, and some varieties of local origin that may turn out to be of considerable value for our climate, but until such are fully tested it is better to stick to the three first-named sorts when planting on a large or fairly large scale.*

* We recommend intending strawberry-growers to read the suggestions by Mr. Benson in his Orchard Notes for the month. Strawberries have proved so successful in the Blackall Range that it should prove an inducement to farmers to plant a fruit which is always saleable at good prices. Mr. Cuning, of Eudlo, has grown strawberries of phenomenal size, and states that the berry finds a most congenial home in the range, no disease having yet appeared.—Ed. Q.A.J.



ARAUCARIA CUNNINGHAMII. HOOP PINE.

Co-operation.

THAT the farmers, dairymen, graziers, and all who derive their livelihood from the land are benefited by co-operation has been clearly demonstrated. When produce has to pass through many hands before reaching the consumer, it must be evident that a portion of the possible profit must go to those intermediary agents who act for both producer and consumer. What we wish to emphasise is, that the whole profit may remain in the producers' hands by their working together for the common benefit. We strongly advise farmers to read the following paper read by Mr. G. Monks at a meeting of the Forest Range Branch of the South Australian Bureau of Agriculture, and published in the February number of the *Journal of Agriculture*. We reproduce the paper here in the hope that it will clear up any doubts which some may yet entertain as to the advantages to be derived from co-operation:—

The first question to be answered is, What is co-operation? The answer is, The unity of individuals to work together for the common good. It is at once a selfish and yet a very unselfish system—selfish, because it better the condition of the individual; unselfish, because each individual helps by this means to better the condition of his fellows. How does it better such condition? By or on account of its being the means of better prices being realised, and better and more markets opened up for produce than can be done under any other system. By the present cut-throat system, or non-system, everyone is struggling to get rid of his produce, entering at once into direct competition with his neighbour. The result is that he not only injures his fellow, but, whilst doing so, succeeds in cutting his own throat.

Co-operation means the abolition of individual competition as far as the marketing is concerned. We shall still have competition, but it will be reduced to a minimum, as it will then only be between large companies.

The question is asked in some quarters, "What shall be done with produce in times of glut?" The answer to that is, "There will be no gluts. If every consumer gets what he or she wants, they can take all that is now produced and a great deal more."

Under the present style of distribution, the produce having to pass through so many hands, all requiring profits, one-half or more than one-half of the consumers cannot afford to purchase on account of high prices, and, as a consequence, they are compelled to go without.

Under a co-operative system, producers and consumers are brought together. There is a bond established between them at once. The producer, whilst receiving more for his produce, is in a position to supply the consumer at a much lower rate, thereby increasing the purchasing power of the buyer almost, if not quite, twofold.

Now, the question arises—How can a co-operative system be organised and worked? In the first place, the consumers should have the whole thing in their own hands, so as to secure the whole profits accruing therefrom. A meeting should be held to see if such a society is required, and also if the producers are willing to work together for such aims and objects. These questions being answered in the affirmative, a committee of five should be chosen to work the matter up and float it into a co-operative company; such committee to be allowed, as compensation for such services, 5 per cent. upon

the application fee, which should be 5s. per share. Shares should be £1 each, liability limited to that amount. There should also be a limit to the amount of shares that one person should hold—say a minimum of five and a maximum of twenty. I think the whole of the money should be paid as follows:—Five shillings per share on application, and the rest upon allotment, as it will all be wanted on account of so much funds being required to establish a going concern, as jam and preserving factories, also other works, will be wanted, not only in the city, but in the fruit and vegetable growing centres, because the carriage will be so much less when these are condensed than it would be when they are in their raw state. A directorate of five, and a competent general manager, with assistant or under manager at the several depôts, would be elected by the shareholders, each shareholder having only one vote, whether he have five or twenty shares. Nothing less than 30,000 shares at £1 per share should be attempted in connection with a market gardeners' fruit and vegetable co-operative society, and at least one-half of this amount should be allotted before such company is registered.

The expense of floating such a company would only be £375, supposing all the shares were allotted—that is, without printing, and a few other items which would not amount to a great deal.

Agriculture.

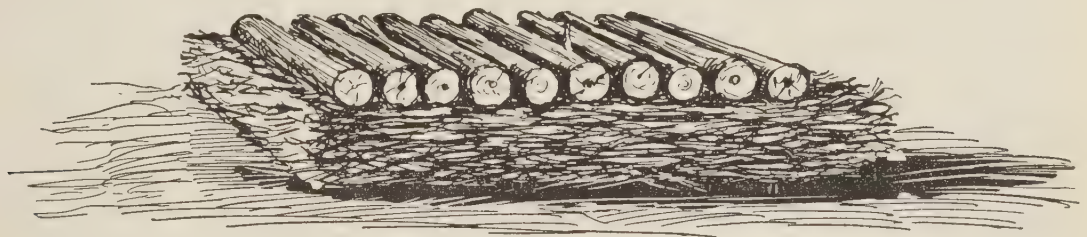
TOBACCO-GROWING.

PREPARATION OF PLANT BEDS.

By R. S. NEVILL,
Tobacco Expert.

I WISH to say in the beginning that improved methods do not imply more labour, but they do imply more painstaking. It means the taking advantage of favourable conditions or creating conditions that are needed, and, more than all, it means the getting of exact results; leaving nothing to chance. It is not necessary to give the many reasons suggested to show that plant beds well burned give the best results, except to say that it destroys the vegetable and insect life, and permits the plants to occupy the entire soil undisturbed. Select for your seed bed fresh land on a hill slope, where it will not be shaded, and near water not subject to overflow, as the land will be moist and need less watering. Black soil is to be preferred, as it absorbs a greater degree of heat.

Clear the ground of undergrowth and stone, and then put on a layer of brush and leaves to the thickness of two or three feet, and then on top of that put wood and logs, covering it well over, so that when it is burned off it will leave a heavy bed of coals.



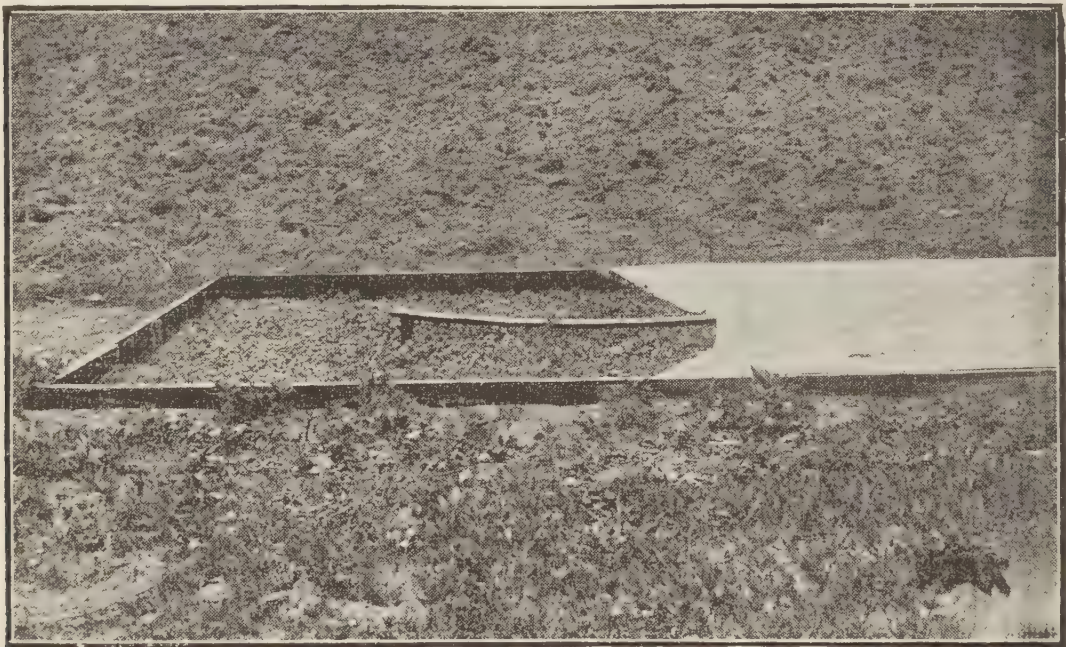
The ground should be burned until it is a red or brick-dust colour, in order to destroy all seeds and insect life, and so as to completely pulverise. Do not burn when the ground is wet. When it has cooled, rake off all unburned wood, but allow the ashes to remain on the bed, and then spade it up to the depth of 6 inches, being careful to reverse the soil. It should then be well chopped with a hoe and raked until the ground is thoroughly pulverised and the ashes well mixed with the soil, all sticks, roots, and stones being removed.

Do not make the beds too narrow, as they will get too dry; 6 feet is a very good width, but they may be as long as desired. Sow a teaspoonful of seed to 100 square yards of ground; this will make the plants thick enough, as that quantity of seed will yield 12,000 to 15,000 plants. A teaspoonful will hold from 18,000 to 20,000 seed, and a yield of 75 per cent. is as much as the best seed will give. It is better to have the plants too thin on the bed than too thick, as crowded plants grow weak and spindly, having no strength to overcome changed conditions; and when transplanted many of them die. They do not start to grow readily, and are more subject to the ravages of cut-worms and other pests, causing many missing plants, making your field very irregular in growth, and entailing much extra work in topping and cutting, as the field ripens irregularly. But if your plants are thin, they grow stocky,

with good roots, and are strong and healthy growers, requiring less moisture when transplanted. They grow off readily, soon getting out of the way of pests, and you have a more uniform field at topping and at cutting time.

If you desire to test the vitality of your seed before sowing, take a few in your fingers and sprinkle them on a hot stove; if they are good they will pop and crackle, but if not they will burn and crumble away. When ready to sow your seeds, mix them with cornmeal or slacked lime, as this will show on the bed, and you can see what you are doing. Lime is preferred, as it is a good fertiliser. After sowing do not rake, but tramp or pat in the seed with the back of a spade.

Do not sow all your seed at once, but at intervals of two weeks, that you may have plants of the proper size for transplanting when wanted; sow more than you are likely to need, that you may be able to select the strongest and best plants. In order to keep your plants free from disease and insects, and to get the very best results, it is necessary to canvas your beds. Take boards and set them on edge all around the bed, driving stakes on either side to keep them in place, and thus form a box around it, closing the joints with earth so as to make them insect-proof. The boards should come 5 or 6 inches above the top of the bed. Drive a row of nails on the outside of the box, 10 or 12 inches apart, all around, leaving 1 inch projecting; have a sheet made, of the thinnest cheese cloth, the size of the bed, with holes around the edges to correspond with the nails driven into the box; stretch this sheet over the bed, slipping the holes in the edges over the nails. If the bed is large, lay small poles across the box frame at short distances, to keep the covering from sagging. Be sure to get the very thinnest cloth, that light and air may penetrate.



Canvassed Seed Bed—Canvas half withdrawn.

This covering usually stays on all the time until the bed is abandoned; but watch your plants, and, if they do not appear strong and healthy, you can remove the covering during the heat of the day, say from 11 to 3 o'clock, when insects are not moving about. Make a ditch around the bed to carry off the water during rainy weather. If it is necessary at any time to water the plants, it should be done about sundown; the covering laid off, and, as soon as the watering is finished, replaced.

It is best to draw the water for this purpose in the forenoon, and let it stand in the sun and get warm, as cold water chills both the plants and the soil. It will be found that a canvas-covered bed retains the moisture better than any other, and also induces a more uniform temperature.

If you desire to fertilise the plants, it is best to use liquid manure, either stable or chicken-house—the latter preferred on account of the lime in it; and care should be taken not to have it too strong, or it will burn the plants. To make the liquid, take a barrel of water, put in the manure, and stir until dissolved. If the farmer will follow the above directions, he will have healthy vigorous plants that will stand transplanting, will grow off readily, and be free from insects, and I believe blue-mould will be unknown in his beds. He will have a start ahead of the insects, and will find that he will get his crop to grow with less labour.

CO-OPERATIVE ASSOCIATIONS IN FRANCE.

CO-OPERATION AMONGST STOCKOWNERS.

THE *Journal of the Bureau of Agriculture* (England) some time ago reprinted an account given in the *Journal of the Board of Agriculture* on co-operative agricultural associations in France. These associations are there called “syndicates,” and are formed for various purposes. For instance, stock-owners (*i.e.*, peasant farmers) combine to purchase a pure-bred bull, which is then their joint property. A committee is formed, and a herd-book is opened. Every member is then expected to register the name of at least one breeding cow for services of pure blood. The finest of the calves thus procured are inscribed in the herd-book as breeding animals; the others are sold. The expert committee periodically inspects the breeding animals to see that they are well kept, and that the young animals are properly reared. By such means the value of the herd is materially increased, and the fact that an animal is entered on the register of the society at once enhances its selling value. Numerous syndicates have been formed in France to secure for their members the advantage of cheap fodder, &c., by obtaining large quantities at wholesale prices.

A curious instance of associations for the common ownership of a herd is recorded from Castellar, near the Italian frontier. The care of the collective herd (which consists of draft oxen, she-asses, and some milch cows) devolves upon each of the members in turn for one week, he during that time enjoying the services and produce of the herd. The animals are pastured on the land belonging to the commune, or on private enclosures when the owner permits. When a member dies or retires from the association, the herd is divided up and the society reformed. If an animal is sold or dies, the price or loss is divided among the members in proportion to the interest of each in the herd. These associations, of which there are some thirty in Castellar, are very ancient, and it is said that the system has never given rise to any difficulty among the inhabitants.

Mutual insurance of cattle has considerably increased of late years in France, and in the Department of La Vendée alone fifty-five associations have been established for the purpose. The business of these societies is usually confined to insurance against mortality, but there is one instance of a society insuring its members against the seizure of carcasses intended for the butcher which are declared by the authorities to be tuberculous. The insurance of the milch cows of their members has also become a common feature in co-operative dairies.

FLOUR-MILLS.

In several districts in France, agriculturists have succeeded in dispensing with the services of the miller by forming milling associations on a co-operative basis. One such example is the Co-operative Milling Society of Arbois

(Jura). The capital of this society is not fixed, but may be varied between £800, consisting of founders' shares, and £4,000, the difference being made up of more shares or of bonds subscribed for by associates.

A mill was purchased by the society at a cost of £560, and opened on the 1st December, 1894. The shareholders and associates undertake to have ground by the society all the grain required for domestic purposes and for their animals, but they are not allowed to trade in flour. The charge made by the society for threshing, winnowing, and milling the grain is about 6 $\frac{3}{4}$ d. per cwt. of grain. The net profits at the end of the year are divided as follows:—20 per cent. is placed to the reserve fund, 5 per cent. goes to the shareholders, 25 per cent. to the employees, and 50 per cent. to such shareholders or associates as have spent 10 francs (8s. 4d.) at least in milling or other work. On the 1st November, 1895, the number of members was 220, and some 30 cwt. of grain was being ground per day. Under the existing arrangements, each member receives back the flour made from his own grain, but it is hoped that, in the future, it may be possible to put all the corn into a common stock.

Another society in the north of France has purchased a flour-mill with modern machinery at a cost of £6,000. In this case, the corn is purchased from the members at the current market prices, and the resulting flour is also sold at current prices, preferably to co-operative societies; 25 per cent. of the profits is divided amongst the shareholders, proportionately to the amount of corn delivered during the year; and a further 25 per cent. is divided amongst the co-operative and other bakeries which have affiliated themselves to the mill, in order to ensure a sufficient outlet for the flour. It is estimated that the 25 per cent. returned to the farmers is equivalent to an increase in the price of wheat from 1s. 2d. to 1s. 8d. per quarter; and, in addition, the charges of the corn-dealer, who usually receives 5d. to 10d. per quarter, are eliminated.
—*Mackay Sugar Journal*.

PRACTICE WITH SCIENCE.

LAST month it was stated that the sanitary contractors were busy depositing nightsoil in the Brisbane River, close to Messrs. Pettigrew's sawmills. Otherwise the scene of deposit is in Moreton Bay. Are there no means of fertilising any of the lands near the mouth of the river, instead of making away with a material which, properly applied, would be a valuable factor in the establishment of paying market gardens in the neighbourhood of the city? We might learn a lesson from the following account of the value of nightsoil given in the *Mark Lane Express*:—

A SUCCESSFUL MOSS FARM.

The newly published accounts of the Manchester Corporation Cleansing Department show that the Carrington Moss Farm, which was purchased ten years ago by the corporation for the purpose of utilising the nightsoil and other refuse of the city, has for the year ended 31st March, 1897, left a credit balance of £1,041 9s. 9d. The farm, which extends to some 1,100 acres, was at the time of purchase by the corporation a barren spongy moss, but since then it has been thoroughly drained, and has received over 50,000 tons per annum of nightsoil and city refuse. The farm, so recently claimed from absolute sterility, is now in the very highest state of productive fertility, and carries crops equal in weight to the heaviest crops grown on the "red soil" at Dunbar. Indeed, the Carrington Moss Farm is now in such extremely high manurial condition that it can no longer be profitably used for utilising such enormous dressings of city refuse, and the Manchester Corporation have purchased Chat Moss, about 2,500 acres, which is all in course of being treated as the Carrington Moss has been.

ONIONS AND ONION-GROWING.

BY A. J. BOYD.

As the time approaches for preparing for an onion crop, it will not be out of place to give directions for sowing the seed and for the after cultivation of this most valuable vegetable. There is no reason why onions should be imported in such quantities as we see daily arriving by steamer from the southern colonies. The climate here is perfectly adapted to them, and, if only planted on suitable soil and given the necessary attention, heavy crops are an almost certain result. At one time it used to be said that onions could not be profitably grown as a field crop in the Blenheim district, near Laidley. To disprove this, the writer determined to experiment on the sandy loam of the scrub land on Sandy Creek. The seed was sown in April; the variety, Brown Spanish. The land to which they were to be transplanted was well worked and then rolled to make a hard compact bed. Transplanting was carried on throughout July, and the season having proved favourable the result was a heavy crop of magnificent bulbs, which gave a splendid return for the labour expended. Now, if such a result can be obtained by one farmer, it follows that others can do the same. As there are thousands of acres of similar land under cultivation both there and in many other portions of the colony, it only requires determination on the part of the farmers to enable them to successfully displace the importations from the south.

On looking over an old diary of farm operations, it appears that the writer's crops averaged 6 tons per acre, and was sold at £25 per ton. Are there many crops which will give a like return? The present price of onions in the market is £6 per ton. Now, suppose a crop to yield 8 tons per acre (and we know that double that return has been made), the cash return for a medium crop will amount to £48. Certainly there is a considerable amount of labour involved in planting out an acre or two of onions, but that labour is amply compensated for by the net returns.

A consideration of the following notes, based on practical experience, may, therefore, be of some service. Let us first consider

THE SOIL.

The most suitable soil for onions is a rich sandy loam, such as that of the Blenheim scrubs—free, friable, and easy to work, a soil that will not cake, and not lying so low as to retain the superabundant moisture after heavy rains. In such a case the land should be well drained. An eastern or south-eastern aspect has been proved to be better than if the land sloped to the west, as the onion does not require intense heat to bring it to perfection.

Before sowing the seed, it is important that the seed beds should be clear of weeds and of their fallen seeds. By sowing in April or May, there is not much to fear from weeds; still it is advisable that the land, both of the seed beds and of the area proposed to be planted out, should be turned up and exposed to the weather for some time previous to sowing. As soon as the weeds appear, give the land a good scuffling, and if this be done two or three times between February and April there will be no trouble afterwards. If the soil be not virgin scrub, or if it has borne crops for many years in succession without manuring, it should be thoroughly well manured with stable dung, ashes, bonedust, &c., as the onion demands plenty and the best of nourishment. New scrub land is rich enough in natural fertilisers not to require any addition of manure.

PREPARING THE SOIL.

In planting out onions a very serious mistake is often made, and that is, the soil is carefully worked, reduced to a fine tilth, and the plants are set out in a soil which is loosened to a depth of perhaps 8 inches. From land

prepared in this manner no good results need be expected. The onion requires a firm bed; otherwise the plant, instead of making a large well-shaped bulb, will run to neck, and have more the appearance of a leek than of an onion. Therefore, the land before being planted must be well solidified by rolling.

THE SEED BED.

Onions may be sown broadcast, or they may be drilled in, or they may be sown in a seed bed and afterwards planted out in the same manner as cabbages. The best way is to drill them in. In this case, about 2 lb. of seed per acre will be required. The seeds must be dropped at a distance of about 2 inches apart in the drill, and the drills should be from 12 inches to 15 inches distant from each other. The plants will afterwards require thinning out with the hoe. When sown in a seed bed, planting out must be resorted to—a tedious process, but one that pays well for doing well.

On rich soil the plants may be 6 inches apart. The drills should be slightly raised, and the roots of the plant firmly embedded in it—allow the bulb to, as it were, squat on, not under the surface. As the plant grows, the soil must be kept perfectly clear of weeds, and, where the working of the ground has thrown the soil against the bulbs, it must be drawn down, so that only the root is in the ground. Where this has not been attended to, the remedy for the resulting want of bulb formation is to wring the necks of the plants, or, at least, to bend them down with a twist. This will have the effect of inducing the formation of bulbs.

When sowing the seed, care should be taken that they are not covered to more than their own depth. If sown deep, many seeds fail to germinate, and most of those that do appear will make an abnormal growth of neck, causing much labour in drawing away the soil from the incipient bulbs. The writer has never sown onions broadcast, and therefore offers no opinion on the value of the method. Of course more seed would be required per acre, and, if weeds are troublesome, a good deal of hand work would be necessary.

Now about the seed. There are few seeds so annoyingly deceptive as onion seed. So difficult was it to get good seed in the colony even at 10s. per lb. in the good old days, that growers imported it from Spain. The largest growers at Oxley, Messrs. Martindale and Nosworthy, were most successful with imported seed, but the writer had a very bad experience in this business. Twenty pounds weight of onion seed was sent from a friend in Germany. Instead of packing it in hermetically sealed bottles, he stowed it in calico bags in the body of an immense wooden Swiss cuckoo clock. When the clock was opened the bags of seed were examined and looked perfect in colour and shape; but, alas! when subjected to pressure, no oily fatness was perceived; and when at last it was given a chance and sown thickly in drills, five acres returned the magnificent yield of 72 lb., which, at the rate of £28 per ton, amounted to 18s. Certainly, the land, after a week's waiting for the seed to germinate, was utilised otherwise, but not 1 cwt. of onions was harvested.

Make sure, therefore, of the seed. After sowing, it should germinate in less than a week.

In former days large onions were always aimed at, but now the public taste is in favour of medium-sized bulbs, so that closer planting may be adopted.

Onions may be known to be ripe by the drying up of the tops. As soon as this happens, take them up by hand and leave them on the ground between the rows to dry. As soon as they are dry, carry them carefully with as little bruising as possible to the barn.

As before stated, the Brown Spanish has proved most successful in this colony, but the gentlemen above mentioned grew what they called the large White Portugal onion. It certainly was a splendid bulb, and fetched very high prices in the markets of Brisbane, Maryborough, and Rockhampton.

CHEAP MACHINERY FOR FARMERS.

ON his way to the Stanthorpe Show, the Hon. A. J. Thynne, late Minister for Agriculture, took the opportunity of meeting the Headington Hill selectors at Clifton, in order to ascertain from personal discourse with them, in what manner the department could be of assistance to them in their new life. One of the first requisites was timber for building and fencing. He suggested that the selectors should agree amongst themselves, name the quantity and kind of timber required, and the department would get tenders called for it. The Railway Commissioner had already, at his instigation, agreed to make reductions if the timber were carried in bulk. Having brought the matter to that pitch, he left it in their hands, but if the assistance of an officer of the department was required one would be sent. In the matter of obtaining implements he also invited action to be taken. He had been urged repeatedly to get the Agricultural Department to go in for importing machines. But he said emphatically, no; and while he was in the department he would oppose it. The work of the department was finished when it showed the people the best way of doing things. It would be the greatest mistake for a department to go into a private business like that. At the same time, the cost of many implements was too great for most farmers. It had been pointed out by him that American farmers could get reapers and binders, for instance, at about £18 or £20, while here the cost was over £50. He promised that those here would soon get them at a price very little beyond that to the Americans, and this without the department going into the business. He had made inquiries of Smellie and Co., of Brisbane, of the reason they gave up importing these machines, and ascertained that it cost as much to sell the machines in Queensland as it did to import them. This arose from the numbers of trials and experiments carried out, which had to be added to the cost price. This firm—and others would no doubt do the same—had assured him that, making the usual charge of 5 per cent., they could land reapers and binders in Queensland for £27 10s., the saving being due to the absence of cost ordinarily entailed in taking the machines over the country to sell them. Even if the department went into the business it could not do it less than this. Those who were now ploughing could get the machines in time for harvesting. The details would have to be arranged by the farmers themselves. The orders would have to be accompanied by 25 per cent. of the money; the remainder would have to be paid on arrival of the machines. The same arrangements could be made about other machinery. There should be no more statements about the excessive prices of machinery; the remarks in the past had arisen from the want of commercial knowledge on the part of the farmers. In this matter also the assistance of an officer of the department would be at the disposal of the farmers. He hoped to show that the department to which he was attached had foremost the interests of the farmers, as it should. He pointed out that when the machines were ordered they would have to be taken in their original packages, and if the selectors could not put them together they would have to get assistance. When ordering, too, carloads of nine or twelve would have to be ordered, because that would affect the saving in freight on the American railways, otherwise the cost would exceed £27 10s. by £1 or £1 5s. The fact was set forward as a concrete benefit of co-operation. In connection with the disposal of the grain, he pointed out how inconvenient was the present method, and advocated the erection of an elevator, which would not only load the produce cheaper and quicker, but would grade it, and lead to a better method of selling it. He did not favour the proposal to erect mills, but thought elevators, on the method adopted in America, would meet all requirements of the case. He had no doubt, if sufficient inducement offered, the Railway Department would erect one of these elevators at Clifton.

Dairying.

MILKING COMPETITION AT WARWICK.

ONLY two cows were entered for the competition for the prize offered by the Department of Agriculture for the cow yielding the largest amount of commercial butter. The condition being that there should be three entries, the prize lapsed. Messrs. Reid and Denham offered prizes of £2 2s. and £1 1s. respectively for the same competition without restriction as to entries. The first prize was awarded to a cow (nameless), which yielded 21 lb. of milk, showing 3·8 per cent. of butter fat, and giving 0·893 lb. of commercial butter. The second prize cow gave 15½ lb. of milk, 4·2 per cent. of butter fat, and 0·729 lb. of commercial butter.

The cows were milked dry at 5 p.m. on the day preceding the competition. They were then milked at 9 a.m. in presence of Mr. John Mahon, Dairy Instructor, who also saw the animals stripped on the previous day. Mr. Mahon then weighed and tested the milk with the Babcock tester, and gave his decision as above stated.

TOOWOOMBA DISTRICT.

Competition for Ayrshire Bull.

DRAYTON AND TOOWOOMBA AGRICULTURAL AND HORTICULTURAL SOCIETY.

24TH, 25TH, 26TH JANUARY, 1898.

Cows competing: Property of Mr. McMahon.

Date.	Name of Cow.	Milking.	Pounds Milk.	Percentage Butter Fat.	Commercial Butter.	Average for Day.
1898.					Lb.	Lb.
24 Jan. ..	Mickey ...	Morning ...	16	3·6	0·645	Mickey 1·261
	Blackie ...	„ ...	17 ³ / ₄	4·0	·795	
	Lizzie ...	„ ...	14 ¹ / ₄	3·4	·561	Blackie 1·507
	Mickey ...	Evening ...	11	5·0	·616	
	Blackie ...	„ ...	13 ¹ / ₄	4·8	·712	Lizzie 1·149
	Lizzie ...	„ ...	8 ³ / ₄	6·0	·588	
25 Jan. ...	Mickey ...	Morning ...	15 ¹ / ₂	3·2	·555	Mickey 1·115
	Blackie ...	„ ...	19 ¹ / ₂	5·0	1·092	
	Lizzie ...	„ ...	12 ¹ / ₄	4·8	·658	Blackie 1·792
	Mickey ...	Evening ...	10	5·0	·560	
	Blackie ...	„ ...	11 ¹ / ₂	6·0	·772	Lizzie 1·288
	Lizzie ...	„ ...	8	7·0	·630	
26 Jan. ...	Mickey ...	Morning ...	15	3·8	·638	Mickey 1·248
	Blackie ...	„ ...	15 ³ / ₄	4·6	·810	
	Lizzie ...	„ ...	12	4·8	·645	Blackie 1·831
	Mickey ...	Evening ...	10	5·5	·610	
	Blackie ...	„ ...	16	5·8	1·021	Lizzie 1·317
	Lizzie ...	„ ...	7 ¹ / ₂	8·0	·672	

Cows competing: Property of Mr. Carrigg.

Date.	Name of Cow.	Milking.	Pounds Milk.	Percentage Butter Fat.	Commercial Butter.	Average for Day.	
1898.					Lb.		Lb.
24 Jan. ...	Rose ...	Morning ...	18	4.2	0.846	Rose	1.350
	Beauty ...	" ...	19 $\frac{1}{4}$	3.8	0.818		
	Minnie ...	" ...	22 $\frac{1}{2}$	3.0	0.756	Beauty	1.221
	Rose ...	Evening ...	9	5.0	0.504		
	Beauty ...	" ...	8	4.5	0.403	Minnie	1.273
	Minnie ...	" ...	10 $\frac{3}{4}$	4.3	0.517		
25 Jan. ...	Rose ...	Morning ...	16 $\frac{1}{2}$	4.4	0.813	Rose	1.471
	Beauty ...	" ...	15	3.6	0.604		
	Minnie ...	" ...	17 $\frac{3}{4}$	2.9	0.575	Beauty	1.050
	Rose ...	Evening ...	10 $\frac{1}{2}$	5.6	0.658		
	Beauty ...	" ...	9 $\frac{3}{4}$	4.2	0.446	Minnie	1.288
	Minnie ...	" ...	12 $\frac{3}{4}$	5.0	0.713		
26 Jan. ...	Rose ...	Morning ...	15 $\frac{1}{2}$	4.2	0.729	Rose	1.346
	Beauty ..	" ...	14 $\frac{1}{2}$	3.6	0.584		
	Minnie ...	" ...	19 $\frac{1}{4}$	2.8	0.603	Beauty	1.112
	Rose ...	Evening ...	9 $\frac{3}{4}$	5.8	0.617		
	Beauty ...	" ...	8 $\frac{3}{4}$	5.4	0.528	Minnie	1.247
	Minnie ...	" ...	11 $\frac{1}{2}$	5.0	0.644		

VICTORIAN BUTTER.

MR. ROBERT CROWE, Instructor in Dairying to the Victorian Department of Agriculture, furnishes the following information as to the method adopted by that Department in dealing with butter for export:—

The Department arranged for the shipping of butter to London for five years at $\frac{3}{4}$ d. per lb. This agreement has to run three years more. The Lund and Aberdeen companies were the contracting parties, but the P. and O. and Orient companies came to some arrangement with the approval of the Department by which the bulk of the butter goes by the P. and O. and Orient liners.

The Department receives, handles, freezes, stores, and gives delivery of butter for 2d. per box, or 6s. 8d. per ton.

We have no power to inspect or give instruction, but we do it; and so far have not been ejected from any place.

It is not compulsory to ship through the Department, but there is a mutual understanding that the companies take or give preference to all coming through our hands. Only some of the butter going to Western Australia and Cape Colony passes through us. We so far have handled all the export to England.

The advantages claimed for shipping under Government supervision are: The depôt acts as a collecting centre, and it can be known how much butter will be available for shipment a fortnight ahead. This information is necessary, as the shipping companies want to know before loading at Sydney how much space we will require. We can thus secure space for all beforehand, and regular shipments are ensured. Another great advantage is that, should less space be available than that required, we divide it *pro ratâ* amongst all shippers, taking the quantity they have in cool store as the basis of distribution. If the regulation of this were in hands outside the Department, it would be possible for a number of firms or individuals to secure all the space offering to the detriment of others, and the trade generally. Again, by examining the butter for export, we find where the imperfect butters come from. We then advise the makers as to what steps to take to improve the quality. If no improvement can be made by corresponding, either Mr. Wilson or myself goes to the place and assists them to make a better article. Our export season here is practically over now. We will be considerably over 1,000 tons short. What with the drought, the heat, and fires, our farmers are in a bad way.

CONDENSING MILK BY COLD PROCESS.

By BYRON F. McINTYRE, Ph.G.

Rahway, New Jersey.

CONSIDERING the wide and extended territory in which the concentrated forms of milk are used, their dietetic value and methods of preparation cannot but be interesting to chemists and pharmacists; therefore additional notes are presented on the so-called cold process of condensation.

The process may be briefly summarised as follows:—

1. Reducing the bulk of the milk by conversion of the water of the milk into ice, instead of vapour or steam;
2. The making of the ice on the surface only of the milk, by elevation of the freezing-pans in an atmosphere of zero temperature or thereabouts;
3. Frequent breaking of the surface ice, so that fresh liquid is presented to a freezing effect, with gradual submersion of the broken ice as the bulk of ice increases;
4. Standardisation of the product.

An experimental application of the process was made in Cattaraugus, New York, under favourable refrigerating conditions, and with milk of exceptional milk fat strength. The dairy product of this section had been cheese, and, while there were strains of registered stock in the dairies, there had been little observance of the proper conditions of cleanliness of stables, feeding of the stock, and care of milk as found in the better class of eastern dairies supplying milk for city delivery. Considerable difficulty was experienced in the selection of milk free from "cow odour." Milk with perceptible taint of animal odour is unfit for condensation by cold process, as these odours are intensified by condensation. To correct, in part, flavour defects in the milk, it was run into a vacuum pan, and the pan and contents gently heated to 80° F., a vacuum of 20 inches having been obtained. This treatment extracted animal gases and atmospheric air dissolved in the milk, which were carried to the surface in bubbles, increasing the apparent bulk of the milk about one-tenth. After a few minutes the foam broke up, and the milk became normal in bulk. The milk was then at the proper temperature for removal of milk fat by means of a cream separator which was set to run heavy cream. This heavy cream should assay not less than 50 per cent. milk fat. One object in separating cream from the milk was to secure the extraction of dirt and foreign animal products, which were very much in evidence as a waste product adhering to the bowl of the separator. From the separator the fat-free milk was run over a bank of horizontal copper pipes through which ice water was circulated, reducing the temperature of the milk from 80° F. to 35° F. At this point it should be noted that milk reduced by heat under vacuum conditions in the proportion of four parts of milk to one part of condensed milk will have a viscosity somewhat proportionate to the heat used in the process. In other words, heating thickens the albuminoids of the milk very much as egg albumen is thickened by heating.

In the cold process of condensing, there is no thickening or chemical change in the albuminoids, the density varying proportionately to the water content, so that four parts of milk condensed by cold process does not have the density or the quality of thickness as seen in commercial brands of unsweetened condensed milk. A condensation of five and one-half gallons to one gallon is required to produce a product with the desired consistence or thickness, which is an increase of over one-third in the fat-free milk solids as compared with a standard of four to one. Economically considered, this is unobjectionable, as the skim or fat-free milk has but little cash value, and the preparation has increased nutritive value in its nitrogenous constituents.

To determine the reducing ratio of this skim milk, 100 gallons (the quantity of milk used in a number of experiments) was divided by $5\frac{1}{2}$, giving a final proposed product of about eighteen and one-fifth gallons, which must include the cream admixture made at the finish of the process. The proportion of fat in this finished product should be $14\frac{4}{10}$ per cent., which has its equivalent in about five and one-fifth gallons of the heavy cream. Deducting this volume of heavy cream from the calculated volume of finished product, we have about thirteen gallons as the standard to which the 100 gallons of skim milk is to be condensed by the freezing process. In other words, eighty-seven gallons of water in the milk are formed into ice, leaving an unfrozen balance of thirteen gallons of very thick milk, which represents in milk sugar, casein, and inorganic salts fully nine gallons of solids. The fat equivalent, represented by the five and one-fifth gallons of heavy cream, is adjusted in the final product to represent in a dilution with water three parts, and condensed milk one part, a proportion of $3\frac{6}{10}$ per cent. of milk fat, which is the normal proportion in an average good milk.

The freezing closets having been properly refrigerated, the previously cooled milk, measuring 100 gallons, was put in the pan, the closet closed, and in due time the stirring apparatus was put in motion. After nine hours the whole bulk of milk was converted into a magma of ice crystals and milk sufficiently thick to form into hummocks. When run in the centrifugal, the thick milk measured about fifty gallons. An average sample of the snow-like ice, when melted and evaporated to dryness, gave $\frac{2}{10}$ per cent. of residue. The fifty gallons of thick milk was returned to the freezing closet, and in six and one-half hours it was a dense crystal mass, which, after centrifugal treatment, measured about twenty-five gallons. The ice contained $\frac{7.5}{10}$ per cent. of solids. A third freeze of four and one-half hours and centrifugal extractions reduced the bulk of the milk to about thirteen gallons. The ice from this last freeze assayed $1\frac{2}{10}$ per cent. of solids. The total time both for freezing and extracting was about twenty hours with one freezing closet; but this time, with two closets, could have been reduced from one-third to one-half. It will be noticed that the percentage of solids in the ice increases slightly as the milk becomes concentrated, due to adhering thick milk to the ice crystals. This tendency is overcome largely by increasing the speed of the centrifugal, particularly on the last freeze.

A final step in the process was the admixture of the heavy cream in proper proportions with the concentrated fat-free milk. This final product or condensed milk is a fair representative of milk minus the bulk of its water. It is free from cooked flavours, it has a milk aroma which is true to the milk from which it is prepared, and it mixes easily with water, forming milk from which cream will separate as from untreated milk.

The specific gravity is about 1.16, the colour is a creamy white, and the consistence is smooth, the milk pouring slowly. In taste it is bland and creamy, with a very pronounced sweet taste which is strictly normal, as will be found by diluting with water to original proportions. In keeping properties the new form of condensed milk is superior to whole milk, as the freezing temperature at which the milk is held is destructive of some forms of germ life common to milk, and the natural life of the preparation is prolonged by this partial sterilisation.

A comparative statement of the use of unsweetened condensed milk, cream and whole milk, would be very instructive and valuable, but after careful inquiries it was found that accurate data could not be obtained, as unsweetened condensed milk is classified and shipped into New York as cream, and *vice versa*.

The recorded figures show that cream is preferred by the public, and the judgment of experts is to the effect that there is a diminishing demand for condensed milk, which possibly can be attributed to cooked flavours, lack of taste, and non-adaptability for cooking purposes, or dilution to normal milk.

It is impracticable to condense liquids, except purely alcoholic, by solid formation of ice as in ice manufacture, because the dissolved solids are largely frozen in with the ice.

Liquids containing very soluble principles as nutritive peptones and albuminoids, or solutions having odours and flavours, and liquids with very minute proportions of active constituents are special directions in which the process can be used.

To illustrate: $\frac{1}{2}$ Peptones, the product of digestive ferments on albuminoids, are reduced in bulk, and fresh meat juice can be condensed to a syrupy consistence without change in the extractives or soluble albuminoids of the meat juice.

Juices of fruits and aqueous extractions from coffee are concentrated without the slightest impairment of the quality of the flavours, and with proportionate concentration of flavour.

The aqueous extraction from malt can be condensed with but slight loss of active diastase in the conversion of starch, the diastase being inactive at freezing temperatures. A solution representing twice its bulk of malt, and containing about 35 per cent. of maltose sugar and extractive, was found to have a diastatic strength equal to the conversion of four times its weight of starch.

Horse-breeding.

CROSS-BREEDING.

BY "ARAB."

THAT the superiority of the Shetland and other Scottish Island ponies is derived from the same Arab source from which the Clydesdale inherits his merits, there is no reason to question. Some authorities have ascribed the evident blooded origin of those ponies to Barbs which swam ashore from the wrecks of the ships of the Spanish Armada.

Let us grant that a Barb or Barbs did get ashore from the Armada. Would this account for the total effacement of the old British or Celtic type and colours in the ponies of the Scottish Islands, the varied colours of which to-day prove the high order of their improvement, and show distinctly how far they are removed from the Welsh, Norwegian, or other native breeds?

Anyone who has a practical knowledge of the prepotency of the old British types must answer in the negative.

Had the Islands of Scotland at the time of the Spanish Armada been stocked with old British types such as the Welsh pony, the Barbs of the Armada would simply have been absorbed by the greater prepotency of the native breed.

When we consider what one Welsh pony effected in the West Moreton district of Queensland, overlaying its taffy colour for forty years on such numbers of our horses, saddle and draught, we can realise how little effect a stray Barb or two could have in overlaying and effacing a native breed of such prepotency.

That the improvement of the Island ponies was effected at the same time as the horses of the mainland—that the old British type was overlaid and effaced throughout Scotland at one and the same time—goes without saying. That this has resulted beneficially to its horse stock and preserved it from subsequent deterioration is apparent. It rendered it impossible to do anything but breed true to one type. The fact that this type was the Arab type, beyond which improvement has been unable to reach, is reason sufficient to explain why the Shetland and the Clydesdale are justly held to have no compeers—the one as a pony, that looks a big horse; the other as a big horse, that looks a pony. The horse of Scotland being overlaid with Arab, and all trace of old British blood being effaced, has resulted in Scotland being saved from the evils arising from crossing the straight formation—with its many attendant defects—on the oblique formation of the Arab. The defects in the Percheron, Belgium, Suffolk Punch, Norfolk Trotter, and Shire breeds of horses, when judged from Arab or Scotch standards, are very much in evidence, and Englishmen are but slowly being enlightened to the fact that they exist. Many Australians are in a like position. They cannot apprehend that they are working with a low class of horse stock, deteriorated by cross-breeding formations.

I have endeavoured to show that in Scotland horses, for every purpose, of a most superior order have been bred on purely Arab lines. Their superiority for every purpose for which they have been raised has never been seriously challenged. They have never been divided into nor classed as separate breeds; ponies, hunters, carriage horses, and plough horses have been bred from the common stock of the country, and no arbitrary, defined, or distinctive breeds have been set up. Some attempt has, during this century, been

made to make a distinct breed of the Clydesdale, but for all practical purposes the Clydesdale is the draught horse of Scotland, and the draught horse of Scotland is the Clydesdale.

The question may still be asked how we in Australia are to apply or profit by this Scottish experience. In England they are profiting by it—by rapidly improving the Shire horse by a free use of Clydesdale sires. We shall profit by it if our breeders can be brought to realise the baneful effects of indiscriminately crossing the oblique and straight formation, and get educated to appreciate the greater value of the oblique formation of the Arab for all purposes, compared with the straight formation peculiar to the old types of heavy horses represented by the Belgium, Percheron, Suffolk Punch, and Shires. Too much importance has been given, by writers on the horse, to breeds—any slightly specialised family is at once arbitrarily defined and dubbed as a distinct breed. This to a young or inexperienced breeder is unnecessarily confusing. Belgium, Percheron, and Suffolk Punch are evidently all of one type and origin. In England almost every county gave its name to a breed. It would be a good thing if Australian horse-breeders would simply ignore a deal of those arbitrary distinctions where no practical difference exists, and confine themselves to acquiring a thorough knowledge of the two types of formation. With the straight formation predominant, the horse remains of a low type or order. A horse to be of a high order of merit must have the oblique formation. The cross-bred horse in which a combination of those two formations meet is the unspeakable thing in horseflesh, and the language it provokes is unprintable. I have written to little purpose if I am not understood as an advocate for breeding on Arab lines. Whether they be drawn from Arab, English thoroughbred, Yorkshire hackney, Irish hunter, or Clydesdale, matters little, so long as the oblique lines and stout staying powers of the Arab are obtained.

The Orchard.

ORCHARD CULTURE IN QUEENSLAND.

By ALBERT H. BENSON.

Director of State Farms and Instructor in Fruit Culture.

IN my last article in the *Queensland Agricultural Journal* I endeavoured to draw especial attention to the important question of the propagation of fruit trees, and pointed out the necessity for exercising the greatest possible care in the selection of stocks and scions, but did not enter into the details of the various methods of propagation. In this and the next succeeding articles on "Orchard Culture" I purpose dealing with details, and will endeavour to show the simplest methods of propagating from seed, budding, grafting, layering, propagating from cuttings, &c.

PROPAGATING FROM SEED.

Though this is the natural and therefore the simplest and easiest method of propagation, something more than the mere sowing of the seed is necessary if we wish to obtain the best results; be the same stocks for working over with selected varieties or intended to stand as fruit-producing trees. As stated in my previous article, it is impossible to devote too much care to the selection of the seed, and, in addition to careful selection, if we wish to obtain strong vigorous stocks or seedling trees, the seeds must be carefully planted and attended to when young.

The stones of peaches, apricots, or plums that are required for planting should be obtained as fresh from the fruit as possible, and should be stored in dry sand till the end of the following winter, when they should be thoroughly wetted and kept wet, so as to cause them to burst the shell and start into growth. When this takes place, the kernel may either be removed from the stone or not, as desired, and planted in rows about 3 feet apart, the kernels or stones being set about 6 inches apart in the row. The land selected for this purpose should be a deep, friable, well-drained, sandy loam, not too rich, as such a soil will develop a good root system in the young seedlings, and is easily kept in good order. The stones or kernels should not be set too deeply, about 3 inches being the best depth. The young seedlings should be kept well cultivated and free from weeds, and, when required to be worked, should be budded over as they stand in the nursery row.

Another plan is to plant a number of stones broadcast or in narrow rows in a specially prepared bed or piece of land, and, when the young seedlings are strong enough, to transplant them to the nursery row; personally, I prefer to plant the stones in the nursery row at once, as it is a saving of expense.

Custard-apple seeds may be treated in a similar manner, but the seeds of mangoes, citrus fruits of all kinds, and most tropical and sub-tropical fruits should be planted as soon as they are taken from the fruit.

Citrus seeds should be planted in specially prepared beds, which should be shaded from the excessive heat of the sun, as well as kept well watered, and when the young seedlings are large enough they should be transplanted into nursery rows—choosing a moist, dull day for the work.

Mangoes are best planted where they are to remain permanently, as this method insures the best tree. Two or three stones or kernels should be planted together, and the best tree allowed to remain, the others being pulled up and destroyed. This method is coming into vogue in India, the seedling left being

often crown grafted over with one of the best selected varieties. Mangoes may also be planted in beds or rows and transplanted when required, the best time to do so being during the rainy season.

Nuts of all kinds require to be kept in sand from the time they are gathered from the tree, as they rapidly lose their vitality if exposed to the air; and, if possible, they should be planted where they are to remain permanently. This does not apply to almonds, which can be treated in a similar manner to peaches, but to walnuts, pecans, &c. These nuts can, however, be planted in nursery rows and transplanted during the winter if desired, but they make a better growth and produce the most vigorous trees if planted where they are to remain permanently.

When apples and pears are raised from seed, the seed should be sown in a specially prepared seed bed, and the young plants should be set out in a nursery row, in a similar manner to young citrus seedlings, when large enough to transplant.

The most important consideration in the propagation of seedlings is to sow nothing but the most carefully selected seeds, no matter what the fruit may be, and the next is to take proper care of the young seedlings. All badly grown or weakly seedlings should be destroyed, as such will never make good stocks or trees. When seedlings show especial merit, it is advisable to test their fruiting qualities, as you may obtain some exceedingly choice new varieties by this method; and if the fruit does not turn out to be of especial merit, then the tree can always be worked over with a first-class variety, so that there is little or no loss to the grower.

BUDDING.

This consists in taking a fully developed bud of any variety of fruit that it is desired to propagate and inserting it under the bark of the tree that is to be converted into this variety. Budding can only be accomplished when the tree to be worked over (the stock) is in vigorous growth, and there is a good flow of sap, so that the bark will run freely. The bud must be fully developed, as if immature, though it will often make a union with the stock, it will not grow. Budding is by no means a difficult operation, and no fruitgrower should have any difficulty in performing it if he will carefully follow out the following instructions and study the illustrations herewith, which are reproductions of photographs showing the exact method in which the work is done. Stone fruits—such as the peach, nectarine, apricot, or plum, or almonds—are very easy to bud, the operation being as follows:—

Fig. 1 (Plate II.) shows a branch of a peach tree of the season's growth. The buds at the top end are not sufficiently mature, and the buds at the base are more or less blind, and therefore uncertain, but the whole of the buds in the centre are fit for working. This is termed a bud stick, and Fig. 1 further shows this bud stick denuded of its leaves and ready for working. In the case of the fruits just mentioned there are frequently three buds together, one central bud somewhat pointed and two roundish side buds. The central bud is a wood bud, and the two side buds are fruit buds. Good single buds, plump and full, are always to be preferred, but when not obtainable triple buds can be used, and there is no need to remove the side fruit buds, as these soon die and leave the wood bud to develop and grow.

Fig. 2 (Plate III.) shows the method of holding the bud stick and of cutting the bud in the case of stone and pip fruits, but for citrus fruits the cut should be made from the base and not the top of the bud. The budding-knife (Fig. 7)



Fig. 7.

Plate II.



Fig. 1.

Fig. 4.

Fig. 5.

Fig. 6.

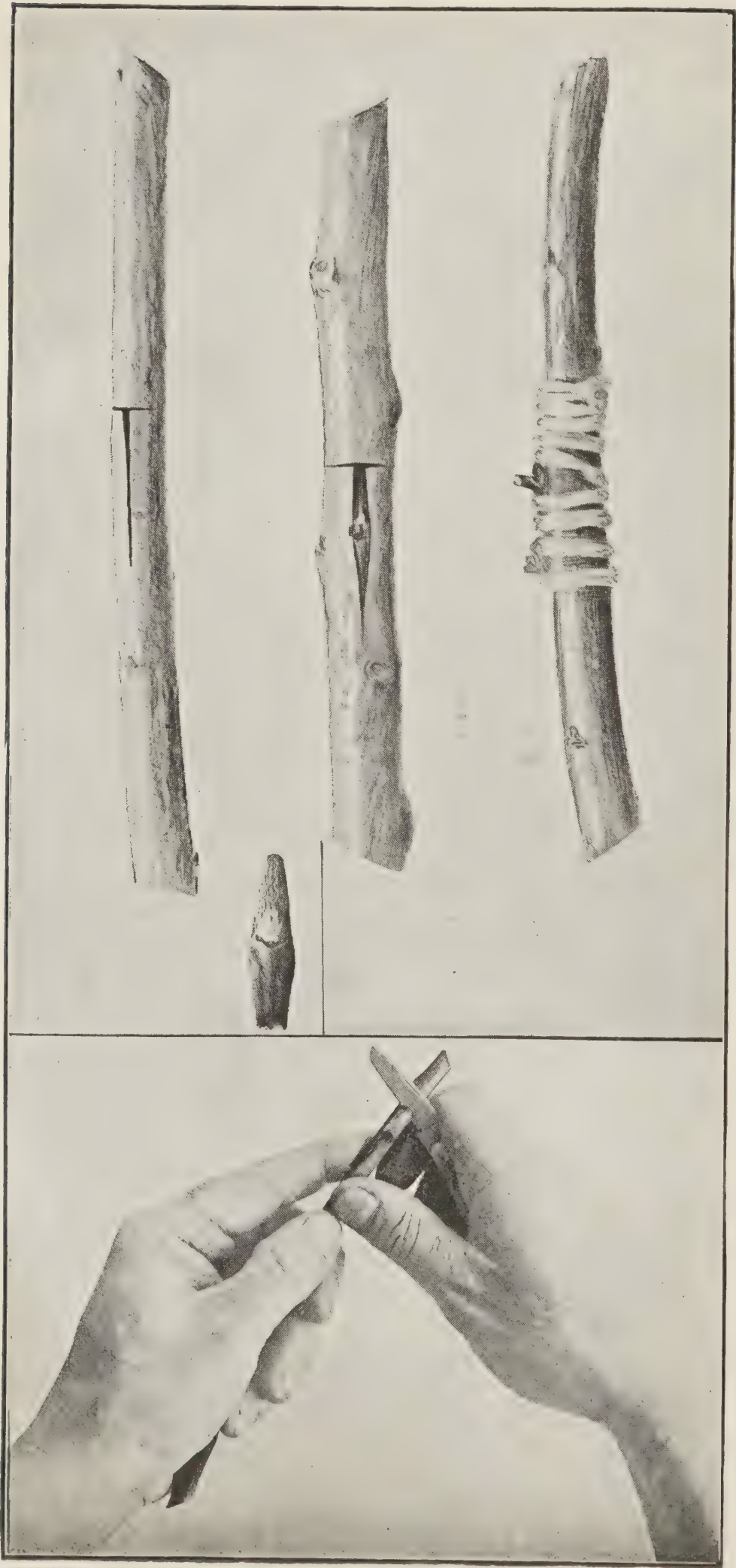


Fig. 3.

Fig. 2.

should be kept very keen, and the cut should be a clean drawing one. The bud should be cut as fine as possible, and if this is done there is no need to remove any wood from the bud, but the bud should be inserted as cut.

Fig. 3 (Plate III.) shows a well-developed single bud as cut and ready for insertion; and if carefully examined it will be noted that the base or lower end of the bud is cut with a slight bevel, as cutting the bud in this manner is found to make it draw better when inserted into the stock than if cut without it.

Fig. 4 (Plate III.) shows the method of making the T-shaped insertion in the stock. The vertical cut is made first, the cut being clean through the bark, but not deep enough to injure the wood. The cross cut is made from left to right, the operator holding the knife at an angle to the stock and making the cut with a twist, which will open the bark sufficiently to admit of the insertion of the bud without quilling—a very important consideration, as the less the stock is injured, the less air there is between the stock and the bud; and the firmer the bud fits, the better the take. Never attempt to bud unless the bark runs freely, as if the bark requires quilling or forcing the take is always more or less uncertain. The quicker the work is done the better, as the union is more perfect and the bud is less likely to dry out.

Fig. 5 (Plate III.) shows the bud in position. The bud as cut (*see* Fig. 3) is held firmly between the thumb and first finger of the operator, and is inserted into the T cut and pushed down into position. If the stock is in good working order, the bud itself when inserted and pushed down will open its own way without the sides of the cut being opened by the budding-knife or quilled, and when this takes place the union is practically certain, provided that the bud is properly tied.

Fig. 6 (Plate III.) shows one method of tying the bud, in which the tie is commenced at the base of the bud and completed at the top, but the tie can be made equally as well if commenced at the top and finished at the bottom. In fact, I prefer the latter method when the stocks are working very freely as it prevents the bud from slipping or squeezing upwards, which sometimes takes place when the tie is commenced from the bottom. Tying should always be carefully done; the base of the bud especially being tied firmly. Various materials can be used for tying, of which narrow strips of thin calico, cotton-wick, and raffia are about the best. In the illustration soft string has been used, so as to show the method of tying as clearly as possible, but in actual practice the tie should be rather more compact, so as to cover the wound more completely. In from two to three weeks after the buds have been inserted they should be examined; and if they have taken, then the ties should be cut, but not removed, as if they are not cut they will contract and injure the growth of the stock. When the buds have missed, the stocks should be reworked; but when they have taken they should be allowed to remain as they are till the following spring, unless it is desirable to start them at once. A simple way to see whether the buds have taken or not, is to touch the leaf-stalk attached to the bud; if this falls off easily the bud has taken, but if it has become hard and dry and is firmly attached to the bud then the bud is dead.

The bud having made a complete union with the stock, the next thing is to start it. As just stated, the bud can either be started as soon as it has made a complete union or it can be allowed to remain dormant till the following spring. In the first case, the top of the stock should be reduced sufficiently to cause the bud to start; and when the bud has made sufficient growth to support the roots, then the rest of the stock, other than that required to train the bud to, should be removed. In the case of the dormant bud, early in spring the whole of the stock should be cut away a few inches above the bud, which will then start, and can be trained to grow upright by tying it to the portion of stock that is left for this purpose. This is best shown by referring to Fig. 8. When the bud is strong enough to support itself, the stock is cut clean away with a sloping cut just above the bud, as shown by

the line A in Fig. 8. This cut should always be carefully and cleanly made, as if so the wound heals more readily, and the union of the stock and bud is practically a perfect one, whereas if the cut is carelessly made it is always a weak spot in the tree, and the tree is apt to break off at the bud during a heavy storm. Citrus buds should be staked, if well-grown, symmetrical young trees are desired; but unless subject to heavy winds, or if the nursery is in an exposed position, it is not necessary to stake stone or pip fruits if they are first well trained to the old stocks.

Besides stone and citrus fruits, most varieties of fruits can be propagated by budding, the process being very similar in every respect to that already described, with the exception that the buds are rather differently cut.

Apple and pear buds are usually cut rather longer and fuller than peach buds, but the operation is an easy one.

In figs, walnuts, chestnuts, and other soft-wooded trees, budding is much more difficult, as, though the method is practically the same, the buds require to be cut much larger, and should have the greater part of their wood removed. The work requires considerable skill, and the ties should be well and firmly put on. The whole operation requires to be done neatly and rapidly, especially in the case of trees having a milky sap, as, if exposed to the air for any length of time, the sap sours, and the union will not take place. I have found waxed ties very good for such fruits, as they keep the wound practically airtight, and therefore prevent it from souring.

In addition to T-budding, there are several other methods of budding, such as ring-budding, whistle-budding, and twig-budding, each of value for particular varieties of fruits; but these are more methods for the expert nurseryman or propagator than for the average fruitgrower, for whom a thorough knowledge of T-budding is all that is necessary.



Fig. 8.

THE MEXICAN STRAWBERRY.

"A BERRY of surpassing merit, wondrous beauty, and luxuriant plant growth," says a writer to the *California Fruitgrower*. "This berry is as near perfection as has yet been attained in a strawberry. It is a rapid and beautiful grower, with clean healthy foliage of a dark-green colour. The young plants of this variety need no petting, but take hold and grow rapidly. Generally these young plants perfect a heavy crop the first season. A strange peculiarity of the Mexican Strawberry is, that it will yield fruit for five or six years without renewing, as against three or four crops with other varieties. It gives heavy crops all through the season in warm climates, and in cold climates it yields two crops a season. The berries are larger than those of any other variety cultivated at the present day. I have all the new and old varieties, embracing about 300 different kinds, and I have a good chance to determine their value. The Marshall, Monarch of the West, Sharpless, Enormous, Australian Crimson, La France, Glen Mary, Brandywine, Rival Hudson, Enhance, &c., are among the largest berries; but the Mexican is better than any of these, because it will average two quarts of fruit to the plant, and in exceptional cases three and even four quarts. The plant itself is almost faultless, attaining a height of about 16 inches, with dense, spreading, dark-green leaves, which greatly protect the blossoms from frost. Last year the cold weather destroyed nine-tenths of the flowers on other plants, but the Mexican pulled through in splendid shape, and

gave an enormous crop. The fruit is slightly conical in shape, and is brilliantly coloured with a fine lustre. In flavour it is rich, sweet, aromatic, and also delicious. It is a wonderful market berry."

We should very much like to see this wonderful strawberry, but must confess to some scepticism as to its reputed bearing qualities. Still, there are being grown in the Blackall Range some magnificent strawberries, which approach, if they do not equal, this Mexican wonder—at all events, in size. Mr. Cumming, at Eudlo, has grown strawberries of which it took only eight to make 1 lb., and other growers have been equally successful.

In order to get further information concerning this wonderful strawberry, we communicated with Mr. Brainard N. Rowley, proprietor and editor of the *California Fruitgrower*. He very courteously wrote at once to Mr. S. L. Watkins, of Grizzly Flats, Eldorado, County California, asking him to forward some plants to Queensland.* Mr. Rowley also writes:—"There seems to be some question in the minds of growers of small fruit as to the real value of the Mexican strawberry. Mr. Watkins stands well in the community in which he resides. . . . I have received a number of letters from various sources advising me to investigate the Mexican strawberry, coral berry, and other fruits before further recommending them. There are parties in California that have been growing these berries for some time, and they speak very highly of them, particularly the Mexican strawberry."

At the same time, our correspondent suggests the advisability of sending any plants received to the experiment farms for investigation before recommending and distributing them, there being in both countries too many worthless varieties already growing.

* Mr. Watkins has not yet forwarded either plants or seed.—Ed. Q.A.J.

CODLIN MOTH.

AN INTERESTING EXPERIMENT.

A SIMPLE and inexpensive experiment to check, if possible, the ravages of the above pest, has been again most successfully tried by Mr. C. G. Zouch, of Balmain West, who treated about forty dozen of "Zouch's Pippins" with vaseline only, and succeeded in saving all but about two dozen. In conducting this experiment the vaseline was applied to the calyx *only* of the fruit by means of a small brush, and while the apples were on the tree, and thereby the future deposit of any larvæ within the calyx was effectually prevented, through the latter being securely sealed with vaseline. The fruit being a very early variety, the process of sealing was carried out early in last November, and occupied altogether about four hours; and, the vaseline being waterproof, it remained on the fruit up to the date of picking the latter (early in December), when it was quite ripe. Previous to dressing the fruit, it was carefully selected and thinned out, and any showing signs of either decay or codlin moth were promptly removed from the tree and destroyed. The results were most satisfactory, most of the apples proving to be entirely free from codlin moth; and although the fruit was very early, it was of excellent size and flavour, as can be certified to by those who tested the specimens submitted to them for trial. Mr. Zouch's experiment is of considerable interest to orchardists generally, and may be easily tried by anybody possessing a few trees, without any great expenditure of either time or money. China pears, sealed with vaseline at Mr. Zouch's suggestion, have also given splendid results at Gladesville this season, the particular tree so treated having very few pears showing traces of codlin moth—a rather remarkable circumstance with regard to those particular fruits.

The old idea that the egg was laid in the blossom is exploded, and it now appears that it is deposited by the moth on the outside of the fruit, and finds its way a few days after hatching into the calyx, eating its way to the heart of the apple. Mr. Zouch seems to have found an almost infallible remedy by applying vaseline. If this is proved accurate, it would lead to the growing on the low espalier system.—*Australian Agriculturist*.

Viticulture.

CELLAR CONSTRUCTION AND REQUIREMENTS.

By E. H. RAINFORD,

Viticulturist, Queensland Agricultural Department.

THE CELLAR.

ONE of the first necessities in wine-making is a cellar, wherein to make it and store it, built on certain rational principles which will permit the wine to keep sound, mature, and improve. This is a point to which vigneron in Queensland are, with one or two exceptions, singularly inattentive; they make and store their wine in erections without one single requisite of a properly constructed and arranged cellar, the majority being merely a barn or shed with an interior temperature ranging from freezing point to 100 degrees Fah.

Wine cannot be expected to keep sound under such conditions, much less improve, and consequently some vigneron have to suffer a serious yearly loss by wine fermenting badly and afterwards becoming sour, pricked, or scuddy, or by after fermentation causing loss of colour, flatness, and other defects. The one panacea hitherto has been to fortify wine to avoid these dangers, whereas had more care been taken in building a rational cellar, no matter how small for a beginning, they would have avoided these troubles. There is not only a pecuniary loss, but, what is worse still, Queensland wines lose their name. It is not to be denied that both outside and inside the colony Queensland wines have acquired a bad reputation entirely owing to the defects mentioned, and the drastic remedies employed to prevent or mask them. Unless measures are adopted to put an end to the evil, our wines will continue to bear a bad name and have a restricted sale, bringing a loss alike to the vigneron and the colony; and one of the measures to be employed to ameliorate this state of affairs is undoubtedly a proper system of cellarage. It is perfectly useless for any man to plant a vineyard and start wine-making if he has not a properly constructed cellar to store it in; and if his finances will not permit of his going to the expense, he had better drop wine-making and sell his grapes to other vigneron. Some advice on the requirements of a cellar and its construction will, no doubt, be useful to many of our vigneron.

It is in the cellar the wine is lodged from its birth, to grow, improve, and acquire those qualities which will stamp its future character and value. To effect this, it should be so constructed as to maintain during the hot season a temperature of from 70 degrees to 75 degrees, and for the winter not lower than 50 degrees to 60 degrees. If the summer temperature can be still further reduced, so much the better. Alternations of heat and cold are liable not only to compromise the future qualities of the wine, but likewise its preservation and soundness, by provoking fermentation or dangerous chemical decompositions and recombinations. It must not be forgotten that wine is of a very complex nature, many of its constituents being easily decomposed, and the maturing will be best performed in a perfect state of repose. For this reason not only should brusque changes of temperature be avoided, but likewise all causes of vibration which could promote internal movement of the wine.

The cellar should not be too damp or too dry. In the former case you risk contamination of the wine by fungus growth and mouldiness of casks and cellar utensils; in the latter, you have evaporation of the wine, shrinkage of empty casks and hoops, &c.; but of the two evils choose the latter—overdampness cannot be too much condemned.

Cleanliness of the cellar is of the first importance; nothing should be placed in it that could by any possibility give a taint to the wine, whether substances emitting offensive odours or fruit or vegetables. A case came under the writer's observation of a cellar full of excellent wine being ruined by a quantity of onions being stored behind and under the casks; the wine had acquired a strong flavour of the vegetables. Scrupulous cleanliness should likewise be observed in sweeping up and removing all litter that could harbour germs.

In building a cellar, the dimensions must depend upon the size of the vineyard, the amount of stock required to be put away for maturing, and, to a certain extent, upon the nature of the ground intended to be built on; lastly, and not least, on the expense the vigneron is prepared to incur. It would, therefore, be out of place to suggest in this article any particular dimensions; suffice to say that if the vineyard is a small one of, say, 15 to 20 acres, it should be wide enough to contain a double row of casks from 250 to 500 gallons capacity, with a width of 6 feet between the two rows for working space and 2 feet between the casks and the walls of the cellar, or in all say 22 feet; the length must be determined by the amount of stock you wish to put away for maturing.

Three years' stock of a 15-acre vineyard, taking 2 tons to the acre as an average crop, will be nearly 11,000 gallons, which, if lodged in two rows of 500-gallon casks, will require 66 feet of cellarage in length and 22 feet in width; a fourth year's stock can be stored in pipes above and between the 500-gallon casks; and, on the supposition that one quarter of the yearly crop is made into fortified sweet and dry wines, another year's stock can be lodged on the upper floor; so that in a cellar 66 feet in length five years' crop of a 15-acre vineyard, or about 18,000 gallons, can easily be housed. Should more than 25 per cent. of fortified wines be made, there will be a corresponding increase of room below. To the 66 feet of cellarage must be added about 20 feet for the fermenting-room, making a total length of 86 feet to 88 feet of cellar for a 15-acre vineyard. Should the length be regarded as excessive, by widening the cellar to admit of a triple line of casks, the dimensions would be altered to 50 feet by 34 feet; but it must be remembered that, under certain conditions, the wider cellar will be less cool than the longer.

Four years' stock has been taken as the base to calculate upon, because the majority of Australian wines are quite ripe for bottling at that age. It is exceptional to find wines that require maturing in cask longer. No account has been taken of the space necessary for a bottling department in the above measurement; this must be added on (if the bottling is done in the same building) to the end opposite the fermenting-room, and divided from the main cellar by a wooden partition with a sliding door; but many vignerons prefer to have that done in a separate building communicating with the cellar. A 15-acre vineyard has been chosen to calculate the measurements by, as a vineyard about that size is fairly common in Queensland. For larger or smaller vineyards the dimensions will vary in proportion. Again, the 500-gallon cask has been chosen as typical, but for large vineyards and wineries that size would take up too much room and an admixture of larger casks would be necessary; the width of the cellar would also have to be increased to allow of four rows of casks being lodged in it.

THE SITE.

Having decided on the dimensions of the cellar, the next thing is to see if advantage can be taken of any elevation or rise in the ground within easy distance of the vineyard, as that would materially benefit the cellar in assisting to maintain a cool and even temperature all the year round, care being taken that the site is away from causes of vibration, as railroads, heavy traffic, or machinery. Supposing such a rise to exist, proceed to excavate a slice out of it 12 feet in depth and of the proposed length of the cellar. Should the

elevation be short of this length, make it up with the earth that is being excavated. In this manner one side of the cellar up to the height of the first floor will be protected from the sun by the mass of the elevation in which the cellar has been sunk, and the internal temperature of that mass will greatly influence the temperature of the structure. Should the protection be on the north side, the vigneron will be very fortunate, as the south will not require any artificial protection; but if, on the other hand, the elevation should be on the south side the north wall must be protected up to the floor above, either by the earth excavated or by a veranda sufficiently wide to keep the sun off it at any time during the day. Should the elevation be either on the east or west side, the opposite must be protected in like manner, and the north end by a lean-to shed.

Supposing, however, no elevation offers itself, but the ground is quite flat; in that case it will be necessary to sink the cellar in the ground 6 feet over the entire area, taking care that the length is from east to west, and all the earth excavated should be banked on the north side to the height of the first floor. The east and west ends should be protected by lean-to sheds to the same height. The principal entrance at the east end should be by a flight of steps or an incline, taking care to prevent the entry of rainwater.

If the vigneron will go to this trouble and expense, he will have a lower story that will always be cool inside, no matter what the heat is externally, and, in addition, will have more equality of temperature, and none of those sudden variations which are so detrimental to wine.

If, however, the vigneron is unwilling to go to the expense of sinking his cellar underground, but decides to build it on the level of the soil, he has a choice of two ways of cooling it. The first by making his walls double up to the first floor, and filling in between the two with sawdust, chopped straw, or other non-conducting material; and, secondly, by surrounding all four walls by wide verandas or lean-to sheds to prevent the sun from falling on the lower part of the building, and heating the masonry or woodwork. Quick-growing shade trees should also be liberally planted pretty close to the building. Some people advocate having the space between the double walls empty, holding that a pad, as it were, of hot air acts as a non-conductor of heat. The idea appears to the writer fallacious, and one not to be followed out. The use of non-conducting material, such as sawdust, &c., has been practically proved by him to be very effective.

Whether double walls or verandas are adopted, the reduction of temperature in the cellar will be much less than by the underground system; but whichever is chosen, there should result a lower cellar artificially cooled, 12 feet high, and above this a second chamber, with the top plate to which the rafters are attached at a height of about 5 feet from the flooring. The roof should be carried to the usual height, and have projecting eaves. Some vignerons like a single chamber with a high roof, and, to reduce the inside temperature, carry the double walls right up to the roof, which is lined with boarding to prevent radiation from the iron. This system is far less effective in keeping the lower part of the cellar cool, and is quite as expensive as the upper and lower chambers, besides which there is the loss of space and cellarage given by an upper story. The upper floor is utilised for milling the grapes, storing machinery, casks, bottles, utensils, &c., and for the cellarage of all the wines that are fortified—either sweet wines like ports and muscats, or dry wines like sherries. Being under the iron roof, the temperature will be pretty high at times, but so far from doing harm to this class of wine it will prove very beneficial, as will be explained later on.

The mill should be at the west end of the upper story, and, if the cellar has been sunk in the ground as above described, the grapes can be carted to the level of the mill by means of the natural elevation or that made by the excavated earth. A small door will permit the grapes to be unloaded into any convenient receptacle alongside the mill for crushing. The grapes, after milling, should pass down a wooden shoot into the fermenting vats, which

should be arranged directly under the mill on the ground floor, the shoot passing through one or more small trapdoors in the flooring, according to the number of vats and their position. Should the lower story be above ground, the grapes will have to be run up to the mill in any convenient utensil by means of a block and pulley. By milling the grapes directly into the fermenting vats, labour is saved, and the work done in a more cleanly manner.

The necessity of maintaining the temperature of the must in the fermenting vats at about 85 degrees to ensure a healthy fermentation has been treated upon in last month's *Journal*. By adopting any of the above systems of cellar construction, but more especially the underground system, you will in all probability be enabled to maintain your fermenting must at that temperature without the aid of any apparatus for cooling it artificially, which again is a saving of expense.

It may cause surprise to some that the storing of wines in the hot upper story should be advised. It would appear that for wine to be placed directly under the radiation from an iron roof, and in an atmosphere exposed to great changes of temperature, its welfare must be prejudiced. On the contrary, the situation will prove most beneficial to wines of this class, and will hasten their maturity in an extraordinary manner. It was on this system that in old days Madeiras and sherries were sent round the world in sailing ships, the heat of the hold in the tropics and the movement of the vessel accounting for the improvement in the wine. To this day, at Cette, in France, immense yards are filled with casks of similar wines, which are left without any covering, exposed to the sun, rain, and all the variations of a southern climate for a period of several months or even for a year. The heat and exposure cause, in a comparatively short space of time, an oxidation and etherification of the various constituents of the wine, giving the appearance of age and maturity only acquired by long storage in cool underground cellars. Do not be tempted to try this treatment on light wines unless with the intention of starting a vinegar factory; only heavy fortified wines of 30 degrees and upwards will stand such usage.

See that the beams and planking forming the floor of the upper story be of sufficient strength to support the weight of the wine and casks, which should not exceed 100 gallons in capacity if quick maturing is wanted; in fact, the smaller the cask the better, except that there will be greater evaporation of liquid as the size decreases.

VENTILATION.

The next thing is to explain how the cellar should be divided and ventilated. The upper story is better undivided, if it can be managed, so as to permit a free circulation of air to carry away the heat radiated from the iron roof. Two swing windows on pivots should be placed in the gable walls, open in hot weather, and additional light may be given by one or two small windows on either side under the eaves to prevent the entrance of the sun's rays. Below—that part of the cellar containing the fermentation vats—should be divided off from the rest by a wooden partition having a sliding door to allow passage from one to another. A wooden staircase or steps may be placed here to communicate with the upper story, but so arranged as to be able to shut off any circulation of the air when the fermenting-room is not in use. Light should be given by small windows on the west or south side, according to the position of the cellar, to get the least amount of reflection or radiation from the sun. The same reasons must govern the position of the windows of the rest of the cellar, preference being given always to the south. All the lower windows must have external shutters, to be kept closed when not working. The entrance should be provided with sliding doors that fit close, and everything should be done to prevent a circulation of air inside the cellar; all windows and the door should fit well and not gape. If care be taken over these details and the cellar be underground, the temperature ought never to rise over 70 degrees.

The next point of importance is to see that the cellar is not too damp. A certain amount of humidity is beneficial in preventing the evaporation of wine, the loosening of hoops, &c., but, on the other hand, too much moisture is very dangerous, as the mouldiness of all organic matter, generated to a greater or less extent, cannot fail sooner or later to be communicated to the wine, either by exterior growth on the casks, or, what is more probable, by the formation of mould on the inside of empties. A quantity of wine can very easily be spoilt by being racked into a cask in that condition, and once mouldiness is established inside a cask it is very difficult to get rid of. For these reasons, the vigneron must take all precautions to avoid too much humidity; where the sides of the cellars are protected by wide verandas, the soil below will in all probability be fairly dry. Where there are no verandas, the rainwater must be drained away from the building by sloping the ground. It would be advisable to face the earth with concrete or asphalt, although this is not absolutely necessary. The walls, up to the first floor, must be of masonry. The best non-conducting material is concrete; after that, bricks set in cement. Care must be observed in excavating to see whether the dip of the strata is towards the cellar or away from it, as, in the former case, a collection of ground water may find its way from some distance into the cellar weeping through the strata.

If it can be managed, the floor of the cellar should be paved, or at least a layer of concrete be put over it; an earth flooring is always to be avoided, for any wine, must, or cask rinsings spilt on it are absorbed, and become the source of germs innumerable. The cellar, moreover, can never be kept properly clean and free from taint as can a paved place.

INTERNAL ARRANGEMENT.

The internal arrangement of the cellar is more a matter for the taste and fancy of the vigneron, and on this point some hints will be given on a future occasion. For the present, it need only be mentioned that for the storage of light wines, like claret, hock, and chablis, the most preferable sizes are from 250 to 500 gallons, this class of wine perfecting its qualities better in that bulk than in any other. For a very large vineyard, or a winery, there is no doubt that very extensive cellarage would be required to store all the wine in the above-sized casks, so it would be a necessity to increase their capacity; but it is most advisable to keep them as small as can be managed, even if it entails extra cost for the cellar and casks, as, apart from the better quality of the wine made, there is the contingency of wine going wrong to be reckoned with, and it will be better for the vigneron if the cask contains 500 gallons instead of 2,000.

In the fermenting department, avoid the use of a too large-sized fermenting vat. Recollect, the greater the fermenting mass the greater the amount of heat evolved, which must be removed by cooling appliances, or the quality and soundness of the wine will suffer. Unless large amounts of grapes have to be milled daily, vats of 500 gallons will be found sufficient, and in an underground cellar will not in all probability require any artificial cooling. A few smaller vats will be useful for fermenting small quantities of must from choice varieties of grapes, and for the same purpose a certain number of small casks will be required in the cellar.

Many details have been omitted in this sketch of a rational cellar, but the outlines should be sufficient to enable the vigneron to understand the principal requirements, which are—coolness, equality of temperature, absence of vibration and odours, cleanliness.

Botany.

CONTRIBUTIONS TO THE QUEENSLAND FLORA.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

Order ORCHIDEÆ.

LIPARIS, Rich.

L. mowbulana, *Bail.* (n. sp.) Plate XVI. Pseudobulbs, almost globose in outline, rough, globular, irregular-angular, $\frac{1}{2}$ -in. or a little more in diameter, the old ones depressed, bearing 1 or 2 linear-lanceolate recurved leaves, from 2 to $3\frac{1}{2}$ in. long and 3 or 4 lines broad, tapering from above the middle to the base, end apiculate, longitudinal nerves usually 3 on each side of midrib. Racemes half as long again as the leaves, the peduncle portion flattened. Flowers white, about 5, bracts lanceolate, about half as long as the pedicel. Pedicels with ovary very slender, 3 lines long. Sepals and petals about 3 lines long, all narrow, but the latter only about half the width of the former. Labellum longer than the other segments, the lower half erect and loosely embracing the column, the upper half erecto-patent, cuneate in outline, ending in two truncate somewhat jagged lobes, with an apiculate gland in the sinus. No disk-plates or calli. Column slightly shorter than the sepals, winged half-way up, then contracted and more or less abruptly incurved and expanding again under the anther on either side of the stigma. Anther yellow.

Hab.: Mowbunan, or Bunya Mountains, *J. F. Bailey*, who found it forming large flat patches upon the trunks of trees.

Order AMARYLLIDEÆ.

CRINUM, Linn.

C. brevistylum, *Bail.* (n. sp.) Bulb globular-ovate, 4 to 6 in. diameter, not producing a persistent column, but forming an annual crown of foliage consisting of about 12 to 14 leaves of a slaty-green. Leaves ensiform, erecto-patent, from 2 to over 3 ft. long and $2\frac{1}{2}$ in. broad about the middle, then gradually tapering to a rather blunt end. Scapes often more than one arising from amongst the outer leaves, from 2 to $2\frac{1}{2}$ ft. high, compressed, thick, $\frac{3}{4}$ to over 1 in. broad. Involucral bracts $2\frac{1}{2}$ to over 3 in. long, rather blunt, 1 in. broad at the base; flowers in umbel from 8 to 10, pedicels thick, shorter, or sometimes as long as the ovaries which are about $\frac{1}{2}$ -in. long. Perianth white, not strongly fragrant, drooping in the bud; tube rigidly erect under the cup-shaped open flower, green or greenish, 3 to $4\frac{1}{2}$ in. long, more or less angular, segments linear-lanceolate, about $2\frac{1}{2}$ in. long, $\frac{3}{4}$ to 1 in. broad near the centre, the outer ones with subulate green tips. Stamens erect, less than one-half the length of the segments, upper half of the filaments purple, pink, or in the

flowers of some plants white. Anthers narrow, $\frac{1}{2}$ -in. long, style enclosed in the tube and only about two-thirds its length, the upper part purplish; stigma obtusely lobed.

PLATE.—Fig. 2: Showing flower seen from above; Fig. 3: side view; and Fig. 4: tube open to expose style.

Hab.: Turtle Island. Bulbs obtained in June, 1897. The plants grow on the sandy patches above high-water mark, and their presence was traced by the dried foliage which was lying flat upon the sand. The island-grown leaves were no larger than those on the plants at present flowering in Brisbane. Of these, three in number, the filaments of two are white, of the other purple or pink. This, however, may not prove constant. As an ornamental plant, this new species is worthy of cultivation. This species agrees in some respects with that lost species, *C. brachyandrum*, Herb., but not in my opinion sufficiently to allow being placed under that name. Mr. Baker gives a description in his excellent Handbook of Amaryllideæ; and Mr. Benthams, in Flora of Austr. vi., 454, refers to the plant; but neither of these authors saw specimens, and both speak of the species as lost. Mr. Baker's note in Gard. Chron., July, 1881, is: "A native of tropical Australia, introduced to Calcutta by Dr. Carey, and sent by him to Dean Herbert about 1820. It was soon lost from cultivation, and was never figured, and we have not been able to match it amongst the numerous dried specimens received from tropical Australia of late years." Mr. Benthams refers to Bot. Mag. t. 2121, as a figure of *C. brachyandrum*. This is also followed by Baron Müller; but the plate in question represents another species. I think it probable that Mr. Herbert's plant was not belonging to Australia, or at least from the Queensland portion of the continent.

C. pestilentis, *Bail.* (n. sp.). Plate XVII., Fig. 1; showing two separate flowers. Bulb ovate-globular, 3 or 4 in. diameter, usually situated 10 or more inches below the surface of the ground. Leaves deep-green, linear, 2 or more ft. long, 1 to $1\frac{1}{4}$ in. broad, texture firm, margin scabrous. Scape 1 to $1\frac{1}{2}$ ft. high, compressed. Flowers pure white or slightly blushed on the outside, about 10 in each umbel. Involucral bracts about 3 in. long and $\frac{3}{4}$ -in. broad at the base, sometimes tapering to a narrow point, sometimes almost linear with a broader apex. Pedicels $\frac{1}{2}$ to $\frac{3}{4}$ in. long, ovaries beaked, about of equal length with the pedicels. Perianth-tube $3\frac{1}{2}$ in. long. Segments of limb 3 or 4 in. long and 1 in. broad about the middle, the outer with points subulate. Filaments white, not declinate, about half as long as the perianth-segments, anthers lunate about 4 lines long. Style slender, nearly the length of the segments, and slightly green in the upper half. Stigma minute.

Hab.: Bulloo River, *J. F. Bailey*. I was led to give the above name to the present species from the fact that persons camping in places where it is flowering in quantities being apt to be seized with violent vomiting. I have myself felt unwell from the odour of a single flower in a room. The species is very near one mentioned by Mr. Baker under the name *C. angustifolium*, var. *blandum*, also *C. arenarium*, B. Herb., in Bot. Mag. t. 2531. This is placed by Mr. Benthams in Flora Austr. under *C. flaccidum*.

Order FUNGI.

PHYLLOSTICTA, Pers.

P. Uvariæ, *Berk.* Spots subcircular or irregular, brown in the centre, obscurely margined. Perithecia very small, black, sporules ellipsoid or subglobose, 5 to 10 μ long, hyaline.—*Sacc. Syll. Fung.* iii., 59.

Hab.: Somerset. On leaves of *Uvaria membranacea*, not previously recorded from Queensland. First met with on cultivated plants of another Anonaceous plant, *Asimina triloba*, an American tree bearing an edible fruit.



Cannabis sativa, Linn.

Hemp (male plant). after Millspaugh.



Cannabis sativa, Linn.

Economic Botany.

No. 5.

HEMP (*CANNABIS SATIVA*, Linn.)

By J. F. BAILEY.

Derivation.—From the Greek word *kannabis* used by Dioscorides, and that from Sanskrit *canam*; *sativa* implies cultivated.

Description.—An annual, belonging to the order Urticaceæ (Nettle family), with a stem from 3 to 10 feet in height. Leaves numerous on long slender stalks, leaflets 5-7, or only 3 in the upper leaves, acute or attenuate at both ends, sharply toothed, dark-green above, pale or very finely downy beneath. Flowers small; male and female on separate plants. Fruit small.

Cultivation.—Hemp may be either grown in sandy, gravelly, clayey, or peaty soils, which should be deep and fertile, and contain a fair amount of humus. It is very scourging when grown for the seeds, but quite non-exhausting when nothing of it is carried away from the field, except the fibre. The seed is generally sown broadcast, 2 to 2½ bushels to the acre, and lightly harrowed in; yet they may be raised in drills at distances of about 32 inches. When grown for fibre, it should be sown thick, in order that the stems may run up to a considerable height without branching, whereby a longer fibre is obtained: when in flower the whole crop is pulled. If grown for seeds as well as fibre, the male plants, which produce the best fibre, are pulled about four or five weeks before the female plants; for as soon as the seeds begin to form upon the female plants the male plants have fully accomplished all the purposes of fecundation, and are in a condition of perfect readiness to yield up a maximum of fibre.

Uses.—The hemp plant is cultivated—(1) for fibre; (2) for the medicinal properties, a resin and a volatile oil, contained in the dried flowering tops of the female plants; and (3) for the seeds (fruits).

1. The fibre, which is of great tenacity, has been in use from remote antiquity for the fabrication of cordage and of strong cloth, such as sail-cloth, sacking, &c.

2. For medicinal purposes there are several forms and preparations of hemp, but the only one which is official is that which is known in India under the name of *Gunjah* or *Ganja*. This consists of the dried tops after flowering, and from which the resin has not been removed. Powell says that, when the leaves have been picked off from the plant to constitute another form of hemp known in India as *Bhang*, little shoots arise from the stem, and that these when picked off and dried form *Gunjah*. According to Garrod, hemp produces a peculiar kind of intoxication, attended with exhilaration of the spirits and hallucinations, said to be generally of a pleasing kind. These are followed by narcotic effects, sleep, and stupor. It has been administered in different forms of neuralgia, spasmodic coughs, tetanus, hydrophobia, and other diseases.

The other forms in which hemp is met with in the East are *Bhang*, *Churrus*, and *Hashish*.

Bhang consists of the dried, coarsely broken, larger leaves of the plant mixed with a few fruits. It is largely used in India for smoking, and as the active ingredient of the sweetmeat called *majoon*. An intoxicating drink is also prepared by infusing the coarsely powdered leaves in cold water.

Churrus is the resin which spontaneously exudes in minute drops from the stems, leaves, and tops. It is chiefly consumed by smoking.

Hashish is largely employed in Arabia, and consists of the dried tops of the plants, which are gathered some time before the seeds are ripe.

The seeds (fruits) are demulcent and oleaginous, but are said to possess no narcotic properties when ripe. As is well known, they are largely used for bird food. They are reckoned a good food for poultry, and are supposed to occasion hens to lay a greater quantity of eggs. They contain about 25 per cent. of a fixed oil, which is used in making varnish.

The hemp plant is said to have the singular property of destroying caterpillars and other insects which prey upon vegetables, and for this purpose is often planted around beds of plants in cultivation. (It may be here remarked that in South Australia the larkspur of our gardens has been used in a similar manner, with good effect, to destroy grasshoppers.)

Popular Botany.

OUR BOTANIC GARDENS.

No. 4.

By PHILIP MAC MAHON,
Curator.

WE left off our chat last month in the middle of a group of Palms—those “Princes of the Vegetable Kingdom,” as Linnæus has so aptly named them. And do they not deserve the title? See how they shoot aloft, tall and stately; how gracefully their leaves droop, every curve displaying what the old-time painters called “the line of beauty and of grace.” How symmetrical their stems, which might serve, and probably have served, as models for the architect!

Structurally, the Palms are closely allied to the Rushes on the one hand, and to the Arums and Aroids on the other. Look at that huge bunch of round fruits which hangs so gracefully from amongst the foliage of the Feather Palm on the hill above you. It is of a rich orange-yellow, and is very beautiful. You will notice that there is a long woody sheath which enclosed the flowers at first, until one fine day it burst open and let the bees take up the task of distributing the pollen from the loaded pollen-bearers to the stigmas of the flowers, taking toll as they went. As a result we now have the fruit ready, to reproduce the stately palm. The woody spathe or flower-sheath, when it falls off, makes, by the exercise of a little ingenuity, a beautiful and lasting flower-basket, and any of your lady friends can, with a very little expenditure of time and trouble, soon make from one of these a much more beautiful basket than can be purchased in the shops. Well, having carefully examined your palm-sheath and the bunch of fruit, turn to the flower of any of the Aroids, say the *Monstera deliciosa*, which a minute's walk will take you to, as it is putting forth its marvellous flowers in the shade garden (bush-house) near at hand. You will note that the arrangement is almost exactly the same as in the palm. There is the sheath (we will call things by English names where possible); and while in the Palm the flowers, and subsequently the fruits, are gathered in a drooping cluster, in the *Monstera* they are gathered on an upright stalk. They look, in the case of the Aroid, like one fruit, but they are really, as in the pineapple, a collection of fruits arranged round a central axis.

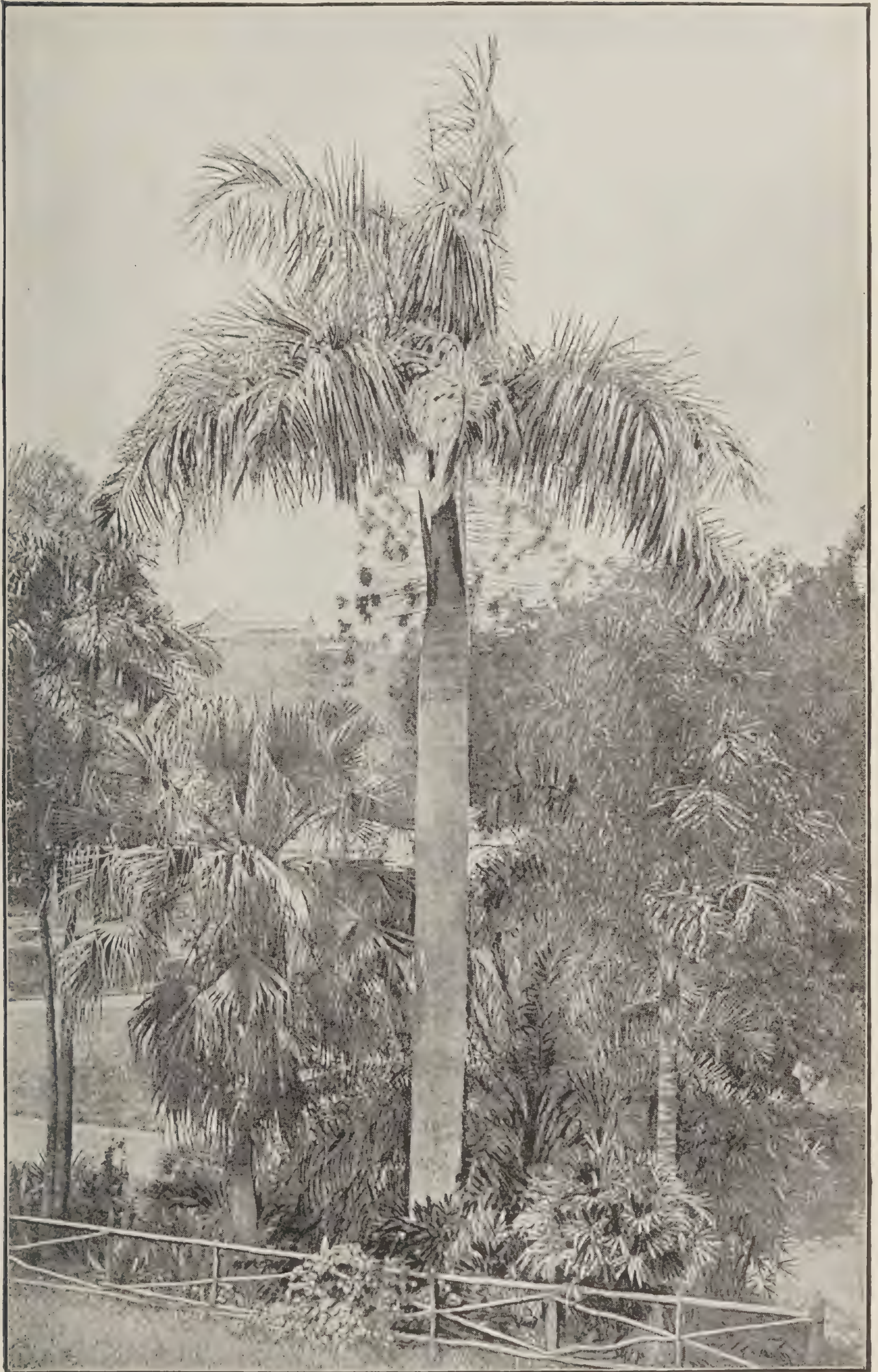
Every palm is beautiful, most of them eminently so. Once seen in their native homes, they are never forgotten. He who has navigated the great rivers of India, which look more like inland seas than mere rivers, can shut his eyes, even after the lapse of many years, and recall, as vividly as if the scene were before him, the feathery Wine Palm standing out against some quaint temple, and loaded with the strange pendent nests of the sociable weaver birds, attached to the very tips of the leaves as a security against their wily enemies, the snakes. Or, who does not remember, who has been in the tropical jungle, the Rotang, stretching diagonally onward and upward, its curved thorns taking fast hold wherever it pushes its way amongst the trees; the lower leaves dying away as the younger ones are protruded into the light and air. And then you remember, as your vessel lay in the Eastern seas, near some low coast amongst—

Those treacherous isles that lie
In the midst of sunny deeps;
Where the cocoa stands on the glistening sands,
And the dread tornado sweeps.

how you watched in a hushed awe the sun go down behind the curtain of cocoanut palms, and thought how beautiful was the world! Palms enter largely into the economy of our daily lives; much more largely than most of us imagine, while to millions of our fellow-citizens of the world, palms mean their whole existence. Every house is full of articles made from palms. That matting on the floor comes from the cocoanut; that fan yonder lady wields so gracefully is made of the leaf of the Chinese *Chamærops*; that set of chessmen is carved from the fruits of the ivory palm; that servant is wielding a brush made from the fibre of a palm collected in the haunt of the jaguar and the anaconda, and carried many a weary league by Indians. Those beautiful chairs have their seats made of the split stems of a *Calamus Palm* from Sikkim, the same of which the mountain tribes construct their wonderful bridges, which are so awe-inspiring to Europeans that one Governor-General of India owed his death to the shock received in crossing one, but over which the native trips as lightly as any maiden in a ballroom. In every department of life it is the same. Palms are with us everywhere, and to us, dwelling in the haunts of civilisation, it is not easy to get far away from some of their products. Even the dreaded schoolmaster's "cane," of which many have painful memories, was nothing but the stem of a palm. In the street, too, palm products are much in evidence. Yonder "chip" hat, with its garniture of quite impossible flowers and the stuffed skin of a slaughtered songbird, is made of carefully prepared strips of the leaves of one of the Palmetto Palms. The shop windows and the shelves of the grocer and the chemist display numerous articles of necessity and luxury made from this most useful and beautiful of the vegetable tribes.

Queensland will grow nearly every palm found on the face of the earth. Every effort is being made here to obtain, from all quarters, seeds and plants of Palms, and numbers of the most useful and beautiful are now being propagated. There, to your right, you have a fine specimen of the most beautiful palm of South America—the Royal Palm, *Oreodoxa regia*. It stands 42 feet in height from the ground to the top of the crown of foliage. Up to the bases of the leaves, it is an ashy-grey pillar, girt from top to bottom with a series of rings where the old leaves have fallen off. At the base of the tuft of graceful feathery leaves you will note one or two green tongue-like processes thrust out. These are the unopened sheaths which protect the flower, and when these burst, the sulphur-coloured flowers hang out in graceful clusters, and are soon discovered by a multitude of bees. This palm is a native of Brazil, and one of the most beautiful avenues in the world is that in the Botanic Gardens at Rio de Janeiro, composed solely of this palm. The people of Rio are very proud of this avenue. At Honolulu this palm is a marked feature in the landscape. Sir Hugh Nelson, when visiting that island, brought back some seeds of this palm, which have successfully germinated and will shortly be planted out. Dr. Seeman, who wrote such a delightful Natural History of Palms, writing of his first impressions of these lovely plants in their South American home, says:—"Even ere the anxious voyager has set his foot on shore he has already perceived their graceful foliage fluttering in the breeze, and waving, as it were, a hearty welcome to the newly arriving stranger. Since the time when Columbus first discovered the West Indian Islands to the present day, these palms have been seen and admired by all whom possess an eye for the beautiful; and I shall never forget the delight experienced when the steamer which had brought me from Europe approached at sunrise the Island of Barbadoes, and allowed me to behold for the first time these noble representatives of a truly tropical vegetation." The palms above alluded to are *Oreodoxa regia* and the Jamaican Cabbage Palm, *Oreodoxa oleracea*.

If you turn to the illustration facing page 138 in the *Journal* of last month, you will find at the right, beneath the giant Sabal, a palm of considerable horticultural interest. It is one of the best of all for decorative work in dwelling-houses. Its name is *Raphis flabelliformis*. It succeeds well



OREODOXA REGIA. ROYAL PALM.



SABAL MAURITIÆFORMIS. SAVANA PALM.

in pots and tubs, and can be propagated by division, which is not so slow a process as is the method employed with the great majority of palms—*i.e.*, propagation by seed.

To the left, in the same illustration, is seen a glimpse of a very remarkable palm, the Coquita Palm, botanically known as *Jubæa spectabilis*. This tree is a native of Chili, where it is used both in the wild and cultivated state in the preparation of "palm honey," which is in great demand. The tree is cut down and the sap allowed to drain from the upper end (after the crown has been, cut off) into vessels placed to receive it. A piece is sliced off the trunk every morning, and a fresh surface exposed. About 80 gallons are obtained from a good tree, the sap continuing to flow for some months. Hard by is a Palm which you will readily notice, because of the thick-set spines with which it is studded. Even the boldest of Brisbane small boys would turn away in despair, though by climbing the stem he might get some unripe and unwholesome fruit of the kind he seems to crave. Some palms are not content with having the stem only defended. The leaves are thickly studded also.

The largest leaf structure in the world is found in a palm. The Victoria Lily, in the Gardens, last year attracted many visitors, but the leaf was a small affair compared to that of the Jupate Palm of the Amazon shores (*Raphia tædigera*). Says Wallace:—"I have cut down and measured leaves 48 and 50 feet long, but could never get at the largest. The segments spread out 4 feet on each side of the midrib."

Palms are of easy cultivation, and it is surprising that in Queensland, where all succeed so well, they are not more largely availed of for the decoration of the home, to which they are so admirably adapted.

When you sow palm seeds you can sow rather thickly. The drainage must be perfect; the soil should be sweet and fresh, about one-third of fine sand should be added. It is well to soak the seed for some hours in very hot water, as this hastens germination. Observe the rule previously mentioned in our talks, to cover the seeds with a layer of soil of about their own depth.

When the seedlings are a few inches high, carefully separate them, and put into small pots. The practice of putting palms into pots many sizes too large for them is a common and fatal error. They are very sensitive to any injury done to the roots, and particularly resent being planted too deeply in the soil. Do not, in potting, injure or prune the roots. Put them in a mixture of loam two-fifths, peat one-fifth, well-decayed vegetable mould one-fifth, sharp river sand or silver sand one-fifth. The bases of old staghorn ferns well broken up will do for the peat. In potting or for decorative work see that you only shift them, at each potting, into pots which allow you merely room to place your hand flat between the ball of earth and the inner side of the pot. Pot them in the spring. Palms love a plentiful supply of water, and delight in a shower bath. See, therefore, that the drainage is perfect, and that they are frequently syringed. The drainage of every flower-pot for most of the plants ordinarily cultivated should be such that, when you fill the inch of space on the surface with water, it will at once begin to flow through the drainage hole. When the roots of a palm become very dry, it is often most difficult to water it thoroughly. You can then stand it in a tub of water until the air bubbles cease to rise. If the drainage is good, this will do no harm. Do not use manure. Our friend the Palm likes charcoal in his soil, and small pieces of broken bone (not bone-dust) help him. Liquid manure used sparingly gives the leaves a brilliant glossy look. With a bush-house, palms can be grown in pots to great perfection, and indeed anyone possessing a back yard can always have a succession of palms for his rooms, and not all the most expensive works of art serve so well as good and well-arranged plants and flowers to mark a home as the abode of persons of refinement and taste.

Latin words must be used in our chats sometimes. Botanical language is not all Latin, as is commonly supposed. Much of it is Greek, some Arabic, and some has been culled from little-known languages, as Gaelic and aboriginal

dialects. It is "a parti-coloured medley of patched and piebald languages." But it is quite necessary. Without it the whole business of botany and horticulture would come to a standstill in double-quick time. It would be a new edition of the Tower of Babel. Fancy having to describe your correspondent on your letter as "a middle-sized man, with red hair, a wooden leg, and freckles," instead of "John Smith, No. 2003, Palm street, Brisbane." This would happen in the world of plants if they all received common names and no other. Besides, to describe the common plants, say of Queensland alone, would require the invention of more common names than the ordinary man has ever used in the course of his life, or ever could use without a severe training. This is a sort of apology for giving in scientific language the following list of Palms for cultivation here. It comprises some of the hardest and most useful of this immense order:—

LIST OF PALMS FOR CULTIVATION IN QUEENSLAND, ESPECIALLY BY AMATEURS.

<i>Acanthophoenix rubra.</i>	<i>Kentia (Areca) sapida.</i>
<i>Acrocomia mexicana.</i>	<i>Livistona australis.</i>
<i>Arenga saccharifera.</i>	" <i>Chinensis.</i>
<i>Bactris gasepes.</i>	" <i>Leichhardtii.</i>
<i>Bacularia africana.</i>	" <i>Marice.</i>
" <i>monostachya.</i>	<i>Mauritia flexuosa.</i>
<i>Borassus Ethopica.</i>	<i>Oncosperma fasciculatum.</i>
" <i>flabelliformis.</i>	<i>Oreodoxa frigida.</i>
<i>Brahea dulcis</i>	" <i>oleracea.</i>
" <i>edulis.</i>	" <i>regia.</i>
<i>Calamus moutanus.</i>	<i>Phoenix canariensis.</i>
<i>Calyptronoma Swartzii.</i>	" <i>dactylifera.</i>
<i>Caryota urens.</i>	" <i>Hanceana.</i>
<i>Ceroxylon andicola.</i>	" <i>paludosa.</i>
" <i>australe.</i>	" <i>pusilla.</i>
" <i>Klapstockia.</i>	" <i>reclinata.</i>
<i>Chamædora elatior.</i>	" <i>silvestris.</i>
<i>Chamærops excelsa.</i>	" <i>spinosa.</i>
" <i>humilis.</i>	<i>Plectocomia Himalaiana.</i>
" <i>Kasyana.</i>	" <i>macrostachya.</i>
" <i>Martiana.</i>	<i>Prestoa papularia.</i>
" <i>Ritchieana.</i>	<i>Pritchardia Thurstoni.</i>
<i>Cocos australis.</i>	<i>Ptychosperma Alexandræ.</i>
" <i>flexuosa.</i>	" <i>africana.</i>
" <i>plumosa.</i>	" <i>Cunninghamii.</i>
" <i>regia.</i>	" <i>disticha.</i>
" <i>Romanzoffiana.</i>	" <i>elegans.</i>
" <i>Yatay.</i>	" <i>laccospadix.</i>
<i>Copernicia cerifera.</i>	" <i>Muschenbroekiana.</i>
<i>Diplothemium campestre.</i>	<i>Rhapidophyllum hystrix.</i>
<i>Dypsis pinnatifrons.</i>	<i>Rhapis flabelliformis.</i>
<i>Elæis guineensis.</i>	<i>Sabal Adansonii.</i>
<i>Euterpe andicola.</i>	" <i>Palmétto.</i>
<i>Geonoma vaga.</i>	" <i>serrulata.</i>
<i>Hyphæne Argun.</i>	" <i>umbraculifera.</i>
" <i>coriacea.</i>	" <i>Blackburniana.</i>
" <i>crinata.</i>	<i>Thrinax parviflora.</i>
" <i>ventricosa.</i>	<i>Trithrinax acanthocoma</i>
<i>Jubæa spectabilis.</i>	" <i>Brasiliensis.</i>
" <i>Torallyi.</i>	" <i>campestris.</i>
<i>Kentia Baurei.</i>	<i>Wallichia caryotoides.</i>
" <i>Becari.</i>	" <i>densiflora.</i>
" <i>Belmoriang.</i>	<i>Wettenia magnensis.</i>
" <i>Canterburyana.</i>	<i>Zalacca secunda.</i>

Apiculture.

HONEY PRODUCTION.

By JOHN CAREY,
Pioneer Apiary, Killarney.

It is possible for honey to be produced in large quantities in this the Queen of Lands. I have read with interest the remarks of John Mahon on dairying and what J. P. Dowling says in reference to the home markets in the last *Queensland Agricultural Journal*, and endorse the importance of introducing our products to the home markets by someone specially interested, and himself an expert. I was, and am still, weighing over whether I will personally go home and sell. If the beekeepers were to combine and give me inducement, I certainly would, as our honey otherwise does not have fair play: it lands in every sort of condition. It is only an expert who can grade, classify, and put honey in its best appearance before the buyer. For instance, I have several tons to land in London this month by the s.s. "Duke of Westminster." The honey leaves here all right; but what appearance will it have when landed in London, arriving in the cold, half candied? Few know how to judge it by the look. The beekeeper knows what I mean. My best honey, good enough for any market in the world, has been classed below what was really not good, and in Mincing Lane the bad honey was sold for more than the primest sample. The vendor sends his honey home at a great disadvantage. It is easy for any buyer to call it Eucalyptus honey. (This cry is possibly raised in order to obtain prime Australian honey at a low figure.—Ed.)

The bulk of my honey is exported, for it is most discouraging to sell locally—a glut occurs, and the smaller producer cuts down prices until one is apt to be disheartened in trying to effect a sale, so I have given our local consumers best. Honey at present is unsaleable, but I am sure it can be sold in bulk when the producer, instead of selling in small quantities, even at a low price, can get his money in one lot. No doubt many get so discouraged in not being able to dispose of their produce that they give up; as one apiarist said the other week—it was a rotten business. Personally, I am sure there is no limit to our capacity for production, and it would be easy to surpass in quantity the exportation of butter at a much less cost. The "Jumna," last trip, took some of our honey home in small tins, for which 1s. per lb. was obtained; but not being on the spot the Queensland producer can only place small lots. My beeswax was sold at the same time, and realised £6 12s. 2d. per cwt., and this, so far, is the lowest price I have yet received; and the best is, I have got the money—much better this than pleading here for buyers at a low price.

The Canadian Mr. Jones, of Beeton, Ontario, one of the world's leading beekeepers, was assisted by his Government in landing 40 tons of honey on the home market, which he did some years ago. It was a surprise. It gave sales an impetus. Mr. Jones considers that beekeeping only requires to be better understood to become a vast source of individual and national wealth; and from years of experience here in Queensland, I am certain it would be so here, for ours is a land of milk and honey, with few of the disadvantages they labour under in a cold climate. Forty tons seemed to me to be an immense lot. Mentioning the matter to a few of our beemen a few years ago, and advising the exporting under an expert, they agreed to its being very desirable. We found that about three of us could send 40 tons; but the matter dropped, and since then I have had to "paddle my own canoe," and have done well. I have a large experience in the business of exporting. For this to be a success, we must have an expert to receive it in London, and to carry the business out in a practical manner there must be a combination, as the greater the quantity the less the expense.

Tropical Industries.

GUARANTEE SUGAR-MILLS.

THE NAMBOUR SUGAR-MILL.

By A. PITMAN CORRIE.

WITH considerable interest many Queenslanders are watching the development of the sugar industry under the new and State-aided system of "guarantee" mills. The system, 'tis true, has not gone beyond the tentative stage; but, nevertheless, it may be regarded as a success, if one is entitled to judge from its present state of development. Because the prospects are encouraging, this system (which has been extensively availed of) is awakening hopes where previous experience had given disappointment, and inspiring confidence where distrust and suspicion once held possession.

Sugar production in Queensland is a large and important industry, and upon its success or failure a destiny depends. Already it has experienced many ups and downs. Fortune is so fickle. But, in spite of disasters—in spite of the fact that, to some at least, the industry seems to have been born under an unlucky star—it has survived the repeated shocks, and gives signs of great vitality.

In some parts of the colony the industry, at its inception, carried things by storm. It conquered by force of its own attraction. People were captivated on all sides, and the Nambour farmers did not escape the influence of the spell it cast. They yielded to the common infatuation, and their enthusiasm—perhaps a little unreflective in the circumstances—threw upon them a load of disappointments when the reaction set in, and the pendulum swung back.

Some twelve or fourteen years ago a speculator proposed to put down, on the Maroochy River, several cane-crushing plants and a refinery for treatment of juice. To this end machinery was ordered and delivered in Brisbane. The hopes of the farmers were raised to the highest, when financial embarrassments cropped up, and soon the enterprise was knocked on the head. Unfortunately, many of the farmers had mortgaged their farms so as to plant cane, and now they were on the horns of a dilemma. They had their newly planted canefields, their mortgages; but—aye, there was the rub—no mills. The enterprise was nipped in the bud of promise. In their sad and sorry plight what could they do but retrace their footsteps. So they demolished their fields, abjured cane-culture, and, with feelings of chagrin and disappointment, returned to potatoes, corn-growing, timber-getting, and other prosaic pursuits. These are a part of "the short and simple annals" of the Maroochy River farmers, many of whom are included in the district over which the Nambour Sugar-mill now holds sway. They found that—

The paths of glory lead but to the grave.

Yea, the grave of buried hopes and expectations.

For a decade at least it was held not polite to allude to the sugar industry in the presence of some of the more impetuous ones who had burnt their fingers. The iron had entered their souls; and although sugar is all sweetness, they were, by some strange law of contradiction, turned to bitterness. Bearing these facts in mind, one can see that a proposal to reintroduce the sugar industry would get, in an ironical sense, "a warm reception." But things had altered. In the meantime the North Coast Railway had been extended

Plate VIII.

1.



2.

1. SUGAR MILL, NAMBOUR.

2. TRUCKING CANE, NAMBOUR.

through the heart of the scrub to Gympie. The price of corn had fallen hopelessly low, and potatoes no longer brought profitable prices; in fact, the "living wage" had almost gone out of farming. Manifestly, then, a fresh outlet or a new industry was needed. Therefore, any suggestion offering these things was gladly welcomed, and the bitter prejudice against sugar production, though deep-seated, soon disappeared.

The preliminaries, interesting and exciting enough at the time of the revival of the sugar question, are of no importance now. We will, therefore, pass on to the time when the Moreton Guarantee Mill (for that is its proper title) became an accomplished fact.

The plant stands upon a site given by the South Australian Land Company. Its position is convenient, being on the side of the railway, within a stone's throw of station and township. The clearing of the site was commenced in March, 1896, and the erection of machinery and plant followed immediately. Messrs. A. and W. Smith and Co., of Glasgow—a firm which was crushed by losses following the recent Cuba insurrection—made and erected the machinery; and Messrs. Caskie and Thompson, of Brisbane, had the contract for the erection of the necessary buildings. This work was done with despatch, and on the 1st of August last year the mill started crushing.

All things, however, were not ready when crushing commenced. The tramways were behindhand. When the mill started, only one and a-half miles of permanent tramway had been made, and portable tramways were non-existent. Fortunately, it was settled weather, and most of the drays and horse teams were pressed into service. When, however, the material arrived, after a delay of a month or six weeks, the portable trams were thrown down with great despatch, and several large fields of cane, inaccessible to drays, were thrown open. The portable tramways then became the chief feeders of the mill.

Taxed to their utmost, the permanent and portable tramways were incapable of keeping the mill going day and night. It, therefore, worked on the "single-shift" system.

Altogether 400 acres were harvested, which gave 7,553 tons of cane. This, in turn, yielded 800 tons of sugar. It is roughly estimated that 150 acres of crushing cane were untouched for the reasons already given. And this, with the acreage harvested and the new land planted this season, gives an approximate estimate of 750 acres for next season.

Some excellent cane was crushed—notably, Messrs. D. and M. Mitchell's and Mr. Chas. Perren's, which was two years old and of exceptional growth. Next season a large quantity of two-year-old cane will be delivered.

Judged by results, the mill is not found wanting. The *net titre* of the first-quality sugar averaged 95 degrees (Baumé); the seconds, 84 degrees (do.); the thirds, 78 degrees; and the Colonial Sugar Refining Company, which took the whole output, commended the company for the excellent quality of the sugar. As a matter of fact, the Nambour Mill (on the testimony of an authority) enjoys the reputation of having this season made the best sugar of all the guarantee mills.

The Moreton Guarantee Sugar-mill has a capital of £32,000, guaranteed by the Government on landed security. Of this amount it has spent £24,250 as follows:—Machinery, £19,250; tramways, £3,000; trucks, £800; survey, water supply sundries, £1,200.

It was expected that there would be great difficulty in getting a tramway to Dulong—a locality adapted to cane, about five miles from the mill. Nambour itself is at the foot of the Blackall Range, and the country in the direction of the hills is broken and irregular. A survey had been made; but the conclusion of the whole business was that a "shute" would have to be made to obviate the difficulty of the ascent too abrupt for rails. Messrs. Dalzell, Mitchell, and Morrow, however, discovered a route, which, by circumbendibus, will carry trucks to the top of the Dulong ridge on a grade of 1 in 20. This is called practicable, and the survey of this route has just been commenced by

Mr. Henry Pope. The survey will be finished in the course of five or six weeks, and it is expected that the tramway works will be commenced in February. The proposed line, which is about five miles in length, will cost £500 per mile.

Mr. John Currie, J.P., is managing director, and Messrs. J. E. Pedlar, G. L. Bury, D. H. Mitchell, and John McNab, J.P., compose the board of directors. Mr. J. A. Malcolm is mill manager, and Mr. J. R. Isgar, J.P., secretary.

The illustrations accompanying afford a good idea of the design of the mill buildings. There are two sets of rollers; and the pulverised cane, after leaving the first set, is carried through the macerator, thence to the second set, where the last drop of moisture is expressed, and the once succulent cane presents the appearance of fibre flayed and rendered dry as tinder. It is then, by means of a mechanical contrivance, carried to the boilers and discharged into the furnaces.

PAPAW (*CARICA PAPAYA*).

By E. COWLEY,

Manager, Kamerunga State Nursery, Cairns.

THE common papaw finds a place in almost every garden in North Queensland, and is to be seen in the edges of our scrubs. Its crown of palmate leaves forms no inconsiderable attraction to Southern visitors. The fruit itself is esteemed by many. It is called Mummy Apple in the West Indies, and that name is applied to it in Fiji. It would seem that this name is more appropriate, as the Mummy bears the fruit. Up to the present but little has been written on the subject. L. A. Bernays, in his "Cultural Industries," says that the fact of the male and female flowers being borne on separate trees gives the origin to the name "papaya," the tree appearing to be so called in tropical America, which, although it is now scattered throughout all the tropical world, is its original habitat. The tree is said to have the property of rendering meat tender by suspending the joints under the leaves. The milky juice is considered to be a powerful vermifuge, but should be used with care. The leaves are sometimes used instead of soap in cleansing linen. The papaw is one of the easiest plants to cultivate. Notwithstanding that it will almost grow in sand, it, like most other plants, likes good soil.

Latterly, there has been considerable demand for the fruit, and it is very questionable whether the cultivation of the papaw will not be found to repay the farmer better than either sugar or coffee, should the demand be continuous, and there is every sign that it will be so. In any case, at least fifty trees should be grown by every farmer, as the fruit when green constitutes an excellent vegetable which is nearly always available. As a fruit, it contains a certain amount of pepsine, which is good for the digestion, while with the addition of a little lemon or orange juice it forms a dessert dish approved of by most epicures.

Up to the present time it does not appear that many new varieties have been described. As a rule the ordinary papaw is almost sessile in the axles of the leaves. But the writer observed some four or five varieties in the garden of Mr. —, on the Johnstone River, of which some were orbicular, others elongated, and on some the fruits were crowded, whilst on others they were sparse. One was of excellent flavour, and differed from any before tasted. At the State Nursery, Kamerunga, others have developed peculiarities not seen elsewhere. One growing outside this office is developing three fruit on one spadix, the length of which spadices varies from 4 to 8 inches in length. This tree is



CARICA PAPAYA. PAPAWE.

under strict observation, and more will be heard of it in this *Journal*. Fruit from male plants were observed by the writer some years ago on the Herbert River. These fruits were seedless, notwithstanding they obtained a diameter of quite 6 inches.

Nicholson, in his "Gardeners' Dictionary," says that "cuttings of ripe shoots, if not deprived of their leaves, will root readily in a sandy soil under a bell glass."

However, in this country they grow so readily from seed that it is quite unnecessary to make nurseries of cuttings. The seed should, however, be planted where the tree is intended to remain. This should be at distances of 4 feet, and two or three plants allowed to grow together, so that male plants may be cut down, leaving the females for the crop.

One or two males should be left for fertilisation purposes, as it is thought that fertilised fruit have the better flavour.

In forming any considerable plantation, a sheltered spot should be chosen, as notwithstanding the tree itself when properly grown is robust, yet it will not stand high winds or exposed positions. At Thursday Island, for instance, where there is usually a strong breeze, the papaw does not seem to luxuriate, whereas in less exposed positions, with perhaps inferior soil, a good crop may be obtained.

At the Aboriginal Station, Yarrabah, Mr. Gribble informs me a considerable quantity is being grown for the local manufacturer of papaw sauce.

It would seem that the neighbourhood of Cairns is particularly well adapted for the growth of this plant. Persons going up the line to Kuranda notice it growing wild in the scrubs, and it would be hard to assure them that the plant is not a native. Doubtless the seeds are somewhat indigestible, and their dissemination has been caused by birds.

The fruit was noted apparently indigenous in some of the lower islands of Fiji. It would be interesting to learn where Linnæus obtained his specimens from. It has been noted by the writer in many parts of the world. Vegetable pepsine, which is obtained crude from the stem and fruit, has considerable value in the London market. Inquiries were made by some merchants regarding the supply from this district some time ago, but up to the present no attempt has been made to collect and export it. It would seem that Cairns should be the centre from which this industry should ramify. Already the exertions of one man to direct the energy of farmers have been in a measure crowned with success. As it is, no locality is so favourably situated as the Cairns district for farmers, as a market is open, and the growth of the tree assured. Unfortunately, no authentic statistics have been recorded. The same may be said of coffee, for which so many are rushing, while the papaw is despised.

Most tropical exploits are mere ventures, but papaw cultivation is a sure thing. At any rate, you can sell your papaw—eat it green as a vegetable or ripe as a fruit.

To extract the milk, which contains the pepsine, would require care; but people of weak constitutions, who are unfit for other work, could do this. It is of very considerable value in the London market at this time. The fruit also contains a large amount of this valuable liquid. It should be collected on glass, dried in the shade, and afterwards scraped off, put into bottles, corked and sealed. So far no intimation has been given in the produce journals of its value in this crude state. An effort will be made this year to obtain its value direct from the London market. While depreciating the laying out of a plantation entirely for papaw, it would form an excellent auxiliary to small coffee farms.

The fruit should be gathered when turning yellow, as it thereby maintains a good flavour. Flying foxes, however, feed on this fruit directly it changes colour.

No other pests have been noted, either on leaves or fruit. Perhaps there is something in its medicinal properties which protects it.

For market purposes the fruit may be gathered when fully formed with no tint of yellow on them. As yet, the industry is in its infancy in Queensland, and it would appear to be unknown as an industry in Java and Ceylon, so that but little literature is available for consultation.

P. L. Simmonds' excellent work, "Tropical Agriculture," 1877, does not mention it. There is sometimes a brief note in the *Tropical Agriculturist*, published in Ceylon, but, so far as can be gathered, it is nowhere cultivated for a crop; but this should not deter Queenslanders from entering on its cultivation. It is likely that fruit sufficiently ripe and properly packed would reach at least the Melbourne market in saleable condition.

The commercial travellers who find it on Northern hotel tables have doubtless already spread its fame as a fruit in that city. Now that ice chambers are provided in most of our large coastal steamers, it should be easy enough to ship a trial consignment to the Southern colonies. It is doubtful, however, if the true flavour of the papaw would sustain a very low temperature without depreciating. But certainly a trial should be made, both within and out of a freezing chamber.

The papaw grows as far south as Brisbane, but, as has been said, it does not do well at Thursday Island. On the Herbert River fruit has been noticed almost as large as a child's head, and perhaps the district between Ingham and Cooktown may be esteemed its most favourable habitat. There is not the slightest reason why farmers should put all their eggs in one basket.



Diseases in Animals.

(TICK FEVER.)

PROGRESS REPORT ON THE REPRODUCTIVE FORMS OF THE MICRO-ORGANISM OF TICK FEVER, WITH SOME OBSERVATIONS ON THE RELATIONSHIPS AND NOMENCLATURE OF THAT DISEASE. (16TH DECEMBER, 1897.)

BY J. SIDNEY HUNT, M.R.C.S. Eng.

ON THE REPRODUCTIVE FORMS OF THE MICRO-ORGANISM OF TICK FEVER.

THE disease amongst cattle called, in Queensland, Tick Fever, has been shown to be, beyond question, identical with that which has long been known in the United States as Texas or Southern Cattle Fever.* The same disease is, almost certainly, prevalent, under different names,† in various other parts of the world, notably the Argentine Republic, South Africa, Roumania, and, perhaps, Java. Its geographical distribution is therefore very extensive, and its economic importance to the chief cattle-raising countries of the world by no means inconsiderable.

From the standpoint of comparative pathology, moreover, the disease is of great interest and importance, because, as will be presently further indicated, it has many points of suggestive analogy with one of the most widely prevalent kinds of malady that affect mankind—viz., malarial diseases.

It is not here proposed to give any detailed account of tick or Texas fever, because this has already been done in a very complete and masterly way by Dr. Theobald Smith and F. Kilborne,‡ whose work has, moreover, been repeatedly verified both in the States§ and in Queensland.|| In order, however, to make clear the bearing of the observations which it is the purpose of this paper to record, it may be convenient to here briefly outline some of the more salient features and already ascertained facts in connection with the micro-organism of tick fever.

Theobald Smith, in 1889, discovered¶ that the remarkable bovine disease, whose nature had baffled all previous observers,** was due to a blood-destroying microparasite belonging to the *Protozoa*, which he named, from its physical characteristics, *Pyrosoma bigeminum*. He, in conjunction with F. Kilborne, also determined the fact that the cattle tick (*Ixodes Bovis*) was the agent by which, in Nature, the disease is communicated.††

The micro-organism in question invades the blood corpuscles,‡‡ and is also to be found free in the serum.§§ In the former situation it is very frequently, as its name implies, more or less pear-shaped, and paired.‡‡ When free it is

* Report on Texas or Southern Cattle Fever, by Theobald Smith and F. Kilborne; Eighth and Ninth Reports of Bureau of Animal Industry, U.S. Dept. of Agriculture, 1891-92.

† For synonyms see note on page 220 of this Report.

‡ *Loc. cit.*

§ *Vide* Bulletin 37 of Missouri Experiment Station.

|| Report on Tick Fever, Queensland Government Printing Office, 1896.

¶ Preliminary Observations on the Micro-organism of Texas Fever, by Theobald Smith, M.D. (*Medical News*, 21st December, 1889).

** Previous American literature of the subject, *passim*.

†† *Loc. cit.*

‡‡ *Vide* Fig. II.

§§ *Vide* Fig. I.

generally single,* and sometimes flagellated.* Whether encysted or free it has usually, when single, a very decided amœboid kind of movement—vigorous in free bodies, and more languid in the case of those within the cells. The number of organisms in any one blood corpuscle varies from a single body, or a single pair of bodies (which is the most common arrangement) up to six, and, possibly in some instances, even more. It is comparatively rare, however, to find more than four bodies in one cell. The blood of the general circulation, such as that obtained from a cutaneous incision, contains few infected corpuscles, even during the height of the fever, and such intracellular organisms as are present are, for the most part, of the single, amœboid, kind. The free amœboid bodies, however, are generally pretty abundant in blood, obtained during the height of the fever, from the cutaneous vessels: sometimes they are quite plentiful in cutaneous blood from animals that have recovered (the infectivity of whose blood is known to persist for years). More frequently in such blood they are by no means abundant, and are then, from the absence of any constant and well-defined morphological characteristic, often very difficult to identify. Both the free and the intracorpuseular forms of the parasite are much better seen in specimens obtained from internal organs: the free amœbæ in fresh preparations from the parenchyma of kidney, liver, or spleen, and the intracorpuseular forms in stained cover-glass preparations of blood expressed from the capillaries of the same organs or, preferably, from those of the heart's substance.†

It has been assumed, with much probability, that the different forms observed represent different stages or perhaps dual forms of development, and that the organism itself, like most cell parasites, belongs to the *Gregarinidæ* or *Sporozoa*. There obviously remain, however, many points in the life history of the micro-organism which still require explanation. What, for instance, is the precise relation of the free amœboid forms to the bodies within the cells? And what position do the latter occupy in the life-cycle of the organism? What is their destiny, and what, if any, their further developments? And, above all, what is the method of reproduction by which the micro-organism multiplies so rapidly in the blood of a susceptible animal—by simple fission, or by some kind of spore formation? and, if the latter, how and where are the spores produced?

Concerning this question of reproductive forms, Smith and Kilborne say:—‡“No forms which might be interpreted as reproductive stages have been recognised at any time in the many cases which have been studied. That the organism multiplies very rapidly in the blood of susceptible cattle is demonstrated by the fact that the injection of a small quantity of infected blood gives rise to the disease. How does this multiplication take place?”

In spite of this declaration of nescience, it is but fair to state that the insight of these excellent investigators went—as will be presently shown—somewhat beyond their actual observations, for they say:—§“There are two possibilities in view. Either the large pyriform body, while within the corpuscle or after it is set free, may enter the reproductive stage and produce a generation of very minute bodies akin to the motile, bright, intraglobular bodies seen in fresh blood, or there may be a free reproductive phase, distinct from the intraglobular forms, taking place in the blood. . . . Nevertheless, no distinctly reproductive phase has been seen during four years of observation of a great variety of cases.”

Towards the elucidation of some of these matters the following observations, made in the course of investigations carried out for the Queensland Agricultural Department, at Hughenden, during the past year, will it is hoped, to some extent, contribute.

* *Vide* Fig. I.

† The specimens from which the accompanying figures were drawn were obtained from the latter situation.

‡ Texas or Southern Cattle Fever. Eighth and Ninth Reports of Bureau of Animal Industry, page 224.

§ Report on Texas or Southern Cattle Fever, by Smith and Kilborne, pages 225, 226.

In some cover-glass preparations, more particularly in such as have been made from an advanced case, a certain proportion of the *Pyrosoma* will be found to have a clear central portion which does not readily stain with aniline dyes (Fig. II.). It will also be seen that a considerable number of these bodies are now free, whilst others, not yet quite free, are still surrounded by the more or less faded and disintegrated remnants of the corpuscle in which they grew. It will also be noticed that some bodies—or rather pairs of bodies—whether free or still within the cells are a good deal larger than others, and that the clear central portion, just now referred to, is, as a rule, more marked in the larger bodies. All these appearances are perfectly obvious in almost any well-stained* blood film from the heart's capillaries of an advanced case.

On examining such preparations one now and then encounters large and very remarkable-looking bodies of more or less crescentic form. So large and so remarkable are they that it is somewhat difficult to account for their having so long escaped notice. The bodies in question are represented in Figs. III., IV., and V. It will be seen that their size varies somewhat. Their length is about three times their breadth, which latter roughly corresponds to the diameter of a bovine red blood corpuscle.

Their shape is very peculiar and characteristic, and may very well be described as crescentic, though one horn of the crescent is almost invariably thicker and more rounded than the other.† The thin end is sometimes pretty sharply incurved, giving them much the form of a farm instrument called a “bill-hook.” They also very strongly resemble the spores of certain hyphomycetous fungi.‡ Sometimes, however, they are only slightly curved, and both ends are rounded. Most of them have a roundish well-defined space, which, in specimens stained with gentian violet, is almost unaffected by that dye (*vide* Fig. III.). This is, presumably, a nucleus (possibly, a vacuole?). Its position in the crescent varies somewhat, but it is perhaps more frequently placed towards the rounded end of the crescent. The substance of the crescent itself appears roughly granular, as will be presently further described. Examined with a high power, the pointed end has frequently the appearance of being open or in some way incomplete. In specimens stained with methyl blue and eosin the round nuclear (?) body is still untinted, and has sometimes the appearance of being more or less diffused (?) in the substance of the crescent; the latter, especially towards the sharper end, is more or less distinctly speckled with eosin-tinted points.§ (Fig. IV.)

The grouping of the crescents is as remarkable as their morphological appearance. Not infrequently they are found singly. But in many instances they are bunched together in very peculiar groups or clusters, the kind of arrangement being to some extent shown in Fig. IV.

* Gentian violet has been found, by the writer, by far the most satisfactory dye in this investigation.

† This peculiarity is worth bearing in mind in connection with the origin of these bodies.

‡ Such a fungus, bearing innumerable semi-lunar spore cases of about the same size as the crescents described, is frequently to be found as a parasite on cattle ticks, especially on the carcasses of such as for some unknown reason turn black and perish before or during the process of oviposition. Whether this fungus grows only as an accidental saprophyte on dead ticks, or whether it has any part in causing their death, as the *Saprolegnia ferax* kills the house-fly, has not been made out, but cultivations from the inside parts of such ticks yield the fungus in abundance. When a hanging drop cultivation of this fungus is kept at a suitable temperature and watched for several days under the microscope, spermatia may be seen to escape from the spore cases, and these spermatia are very frequently in pairs with their ends inclined towards each other, something after the manner of *Pyrosoma*. Its mycelial hyphæ also frequently contain very small, roundish, refractive, actively motile bodies of variable size, which very closely resemble the free amœboids of tick fever. The discovery of this fungus on ticks was made almost at the same time as that of the crescentic bodies in the blood of affected cattle, and so strong was the resemblance (*vide* Fig. VI.) that in spite the intrinsic improbability (some might even say gross absurdity !), both on biological and pathological grounds, of supposing them to be identical, that idea was not completely dispelled until quite a large number of inoculation experiments with the artificially cultivated tick fungus had clearly shown that it had no pathogenic effect when tattooed into the skin or when injected in large quantities—subcutaneously or into the veins of susceptible cattle. This fungus is only here mentioned on account of the waste of time and labour it caused, and might conceivably cause again.

§ This circumstance may, perhaps, be regarded as a small piece of corroborative evidence of the intracorpuseular origin of the crescents.

These very remarkable bodies were first observed by the writer in February of the present year 1897, in specimens obtained from the heart's substance of a cow that was killed in an advanced stage of the acute disease—possibly in the first stage of recovery.* Their nature was not at first at all clear, nor was their relation to the free amœbæ and to the intracellular organisms by any means evident. It was therefore decided, before submitting any detailed report of this observation, to seek the opinion of an authority of the very first eminence. Stained specimens were accordingly forwarded to Dr. Klein† with a request—as from an old pupil to a respected teacher—that he would give his opinion on these, to the writer, obscure points. It is hardly necessary for those who know Dr. Klein to say that his reply was full of “light and reading” as well as kindly interest and suggestion. Dr. Klein pointed out that *the crescentic bodies are full of the young Pyrosoma*—in fact, what is not nucleus is densely filled with these bodies, each young individual possessed of a vacuole (or perhaps nucleus) and a little protoplasm; that some of the crescents are so swollen up as to be on the point of bursting and giving birth to a new crop; that amongst the *Pyrosoma* some are considerably larger and darker stained, and show a clear nucleus (or vacuole ?); also that some crescents are considerably smaller than others, and not quite crescentic yet, and not having their substance differentiated into young individuals. From these facts Dr. Klein leans to the opinion that the *Pyrosoma* grows up into the crescent, and that the latter eventually forms like a cyst endogenously a host of the *Pyrosoma*.

The peculiar grouping of the crescents, before referred to, seems particularly noteworthy in connection with the corresponding grouping together of infected corpuscles as seen in cover-glass preparations from the capillaries of internal organs, and seems to suggest that the clumps of crescents have had their origin in the clumps of *Pyrosoma*-infected corpuscles.

On one occasion was discovered a crescent-shaped cluster of darkly-stained bodies (*Pyrosoma* ?) looking as if they had escaped *en masse* from the crescent envelope (*vide* Fig. III.), which latter is sometimes quite clearly to be seen (*vide* Fig. V.).

More recently some other forms which appear to be still further developments of the crescents have been observed. The specimens were obtained from a cow that was killed two days after defervescence from a pretty acute attack of tick fever. They are well represented in Fig. V., and give the impression that the crescents have grown into more or less irregular spheres, which, in many instances, have burst, scattering the spores (young *Pyrosoma*) broadcast. Intermediate stages between the crescent and sphere have been observed (*vide* Fig. V.). The large, clear nuclear body which was so conspicuous a feature in the crescent is equally apparent in the sphere, and even larger and more defined, but now appears to be placed centrally as a kind of core, round which the young *Pyrosoma* are clustered. In these more advanced stages it is also seen to have taken the gentian violet-dye to the extent that it has acquired a pale mauve tint. The ultimate destination of these nuclear bodies remains a mystery. Is it conceivable that they have some analogy with resting spores, and are the forms which, passing into the organism of the tick, there undergo some alternative form of reproductive development?

The discovery of these crescentic and spheroidal bodies, representing further (cystic) stages in the life history of Theobald Smith's *Pyrosoma*, supplies the piece wanting in his work, which failed only in showing how and where his organism was reproduced. It would seem also to bring that micro-organism into line with other members of the Gregarine class, in which a final spore-bearing cystic stage is known to be as general a characteristic as are the flagellated, amœboid, and cell-parasitic stages in the younger forms. It is not, however, intended to assert that this endogenous spore formation is necessarily the only way in which the tick fever organism multiplies, because Zoology

* These crescents were referred to as “spore case-like bodies” in a progress report submitted to the Stock Department in March, 1897.

† Dr. E. Klein, F.R.S., London.

teaches that other methods of reproduction are not infrequent in the earlier stages of similar organisms. Such other forms have not, however, so far been seen in the organism under consideration.

THE RELATIONSHIPS OF TICK FEVER.

It has already been remarked that the points of resemblance and analogy between tick fever in cattle and malarial disease in man are remarkably abundant. The bovine malady has, indeed, been described as a disease of *malarial type*.* It may be of interest, therefore, to inquire how far this idea is supported by the observations which have just been recorded, and how far it is in accordance with some modern views as to the life history and mode of spread of the malarial parasite. It will be convenient to consider—first, the points wherein the life histories of the organisms of tick fever and malaria coincide or differ; second, the clinical and pathological resemblances of the two diseases; third, the agencies by which each disease is communicated.

THE RESPECTIVE ORGANISMS.

The life history of the tick fever organism is probably something as follows:—Beginning as a free spore consisting apparently of a morsel of undifferentiated protoplasm and (sometimes) a flagellum, it somehow makes its way into a blood corpuscle where it at first appears as a single amœboid body. Then it divides into two (or more?) pear-shaped bodies (*Pyrosoma bigeminum*). Each of these eventually enlarges to form a crescent, in which spores are endogenously produced. The crescent becomes more or less spherical, and, rupturing, sets free a new crop of spores similar to those which formed the first stage of its developmental career.

The malarial organism† in the blood of an infected person also commences its career as a free spore. It somehow makes its way into a corpuscle. There it at first appears as a single amœboid body.‡ This body undergoes certain developmental changes which result in its subdivision into a number of spores, which in due course are set free to commence the life cycle anew. In other cases the intracorpuseular amœbæ, instead of at once passing into the sporulating stage, develop into crescentic§ or semilunar bodies which are probably the most constant and the most characteristic forms of the parasite as seen in human blood.|| Under certain conditions they are seen to undergo further developments¶—first into ellipsoids, then into spheres. From the latter are thrown out flagella processes which eventually become detached, and in this free state are believed by Dr. Patrick Manson to be the homologues of flagellated spores.** From these facts it is evident that there exists a certain rough parallelism in parts at least of the life histories of the microparasites concerned in the two diseases. This is perhaps better seen in the accompanying diagram.

* Preliminary Observations on the Micro-organism of Texas Fever, by T. Smith, page 1.

† The varieties of the malarial organism corresponding to the various forms of the disease are not here considered. The general characters common to all forms only are referred to.

‡ The malarial amœba within the cells, unlike the corresponding form of the tick fever organism, often contains dark swarming pigment (melanin) granules. This phase of the malarial organism also grows to a larger size, and is paler and generally more actively amœboid in its movements.

§ The semilunars of Laveran are generally conceded to originate in this way. The origin, nature, and destination of these bodies are still, however, more or less controverted points.

|| The malarial semilunars differ from the pyrosomal crescents in that they are present in the general blood stream (e.g., from the finger), whilst the latter have only been found blocking the capillaries of internal organs, where, it may be incidentally remarked, they have probably much to do with the blood stasis observed in such situations.

¶ The developments in question are said by Manson to occur only in blood *after* it has been withdrawn from the human body; they are never discoverable in specimens fixed the moment the film is spread. (Goulstonian Lectures, before Royal Col. Physicians of London, 1896; Lecture I.)

** Surgeon-Major Ronald Ross found these flagella to be developed in the stomachs of mosquitoes from such crescents as they had swallowed with blood sucked from malarious patients. It is believed that they represent an alternative form of reproductive development designed for the perpetuation of the *Plasmodium* outside its human host, and would thus seem to lend colour to the suggestion, just now made, as to the possibility of some corresponding dimorphism in the reproductive phases of the *Pyrosoma* in the bullock and the tick respectively.

DESCRIPTION OF DIAGRAM.

- Column 1.—The free amœboid stage common to *Pyrosoma* and *Plasmodium*.
- Column 2.—The first intracorpuseular stage, also common to both organisms.
- Column 3.—The malarial amœba grown larger, and sometimes containing pigment granules. No corresponding stage known in *Pyrosoma*, which never contains pigment granules.
- Column 4.—*Pyrosoma* has become divided into two fresh individuals (*bigeminals*). *Plasmodium* shows two kinds of development: At A. (rosette development), has become segmented into several fresh individuals; at B. (crescent development), has become much enlarged, with general distribution of pigment granules.
- Column 5.—Both *Pyrosoma* and *Plasmodium* are free from containing corpuscles. The *Plasmodium* (in the rosette development) is seen to be breaking up into a number of free spores. N.B.—It is perhaps questionable if it is the rule for *Pyrosoma* to escape from the corpuscle, or to continue to develop in it; the eosin-staining particles in the crescents would seem to indicate the latter.(?)
- Column 6.—Shows *Pyrosoma* grown into a nucleated crescent. *Plasmodium* has also become a crescent, containing central aggregation of pigment, and showing (occasionally) traces of corpuscle in which it grew. Rarely two crescents are developed in a single cell (Manson), a condition of things somewhat resembling the *bigeminal* development of *Pyrosoma*.
- Column 7.—Both kinds of crescents have become spheres. The *Pyrosoma* sphere is giving birth to free spores.
- Column 8.—Represents further developments of the *Plasmodial* crescent-generated sphere. At C. the crescent has developed abortive intracorporeal spores or, at D., thrown out processes which, becoming detached, represent free flagellated spores (Manson).

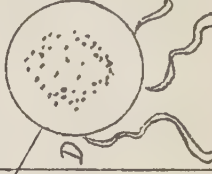
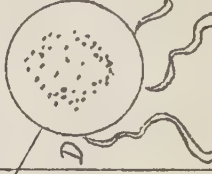
CLINICAL AND PATHOLOGICAL RESEMBLANCES.

Malarial disease and tick fever are alike due to the presence in the blood of a protozoan microparasite of the Gregarine class. The organism, in both cases, invades the red corpuscles, which it destroys in the course of its development. In both diseases the microparasite remains for an indefinite time in the blood of infected subjects, as shown, in the case of malaria, by microscopical observation, and the recurrence of the fever without fresh infection; and, in the case of tick fever, by the persistent infectivity of the blood when injected into susceptible cattle. It is not known whether cattle whose blood harbours the parasite are subject, like malarious patients, to recurrent attacks of fever in the absence of all reinfection from without.

Both diseases occur in acute, malignant, febrile forms, which are very fatal; and as comparatively mild and chronic apyrexial maladies. These varieties are, in each case, accompanied by corresponding modifications in the condition of the micro-organisms in the blood. The acute form (of each disease) is characterised by a great and rapid destruction of the red blood corpuscles, brought about by the direct action of the microparasites, and probably also by toxic substances elaborated by them. The chronic form of both maladies is marked by anæmia and debility. In the acute or malignant forms (of both diseases) the capillaries of internal organs are found to be stuffed with infected corpuscles, comparatively few of which are to be found in the general blood stream. The skin and tissues, both in malaria and tick fever, frequently acquire a yellowish tinge due to changed colouring matter derived from the disintegration of the corpuscles. Hæmoglobinuria is also observed from the same cause. Great engorgement of the spleen is a characteristic lesion of both maladies, and in fatal cases of each this organ is sometimes found to be quite disorganised, and reduced to a semifluid condition. The liver also is, in both, enlarged and bile-stained. Neither disease is, in nature, directly communicable from person to person or from bullock to bullock: neither is infectious or contagious in the ordinary sense. Both can, however, be transmitted by inoculating blood from diseased subjects into healthy ones of the same species.

Other points of resemblance might doubtless be found, but enough has been said to show that the clinical and pathological analogies are tolerably close. On the other hand, it would doubtless be possible to instance particulars in which essential differences exist. For example, malarial diseases are known to be more or less controlled by quinine, and perhaps other drugs, whilst the bovine malady has not, so far, been found amenable to any such remedies.

DIAGRAMATIC REPRESENTATION OF LIFE HISTORIES of **TICK FEVER** and Malarial Organisms

TICK FEVER <i>Pyrosoma Bigeminum</i>									
MALARIAL DISEASE <i>Plasmodium Malariae</i>									

A Sporulating body
 B Antecedent of Semilunar

C Vicarious forms of
 D development of Sphere.

Again, in the all-important matter of acquired immunity, we know that old residents of malarious places are less liable than new-comers to fall victims to the malignant forms of malarial fever, but that nevertheless the protection conferred by one attack of fever is but slight and evanescent.* In the case of the bovine disease, on the other hand, there is some good evidence to show that a very considerable protection†—if not absolute immunity—follows an attack of the acute fever.‡

METHODS OF COMMUNICATION.

A certain rough parallelism has been seen to exist in the life histories of the tick fever and malarial organisms; also some striking resemblances in the clinical and pathological aspects in the diseases they respectively produce. There would appear to be some equally striking analogies in the means by which each disease is spread or communicated.

The Cattle Tick and Tick Fever.—It has been already stated that the cattle tick is the agent by which tick or Texas fever is communicated. This fact has been definitely established by a number of carefully conducted experiments carried on both in America and Queensland.§ It has been proved and re-proved; it has been tested and re-tested; and always again and again confirmed; so that there is no room for doubt in the matter. The experimental evidence, to anyone who will be at the pains to examine it, is perfectly conclusive.||

The micro-organism evidently lives and multiplies as a true parasite in the blood of the bullock. Its precise relation to the tick is not so clear; nor for our present purpose need it be discussed. All we are concerned, in the present connection, to know is that the tick is the means by which the micro-organism finds its way into the bullock, and is probably also the means by which—in some as yet unknown shape or form—it eventually gets out again.¶

The Mosquito and Malarial Disease.—The researches of Dr. Patrick Manson and Surgeon-Major Ronald Ross seem to indicate very strongly that the mosquito is the agent by which the liberation of the malarial *Plasmodium* from its human host is effected; also, that this insect is very closely associated with the life history of the *Plasmodium* outside the human body, and is probably the means by which the malarial germs are disseminated in external nature, and become widely distributed in earth, water, and air, and is thus, *indirectly*, the means by which the disease is spread.**

Following as a commentary on the publication of Dr. Manson's views, there appeared a long and interesting article by Dr. Amico Bignami.†† This eminent authority inclines rather to the view that the malarial organism is

* This fact has been explained on the supposition that such antitoxins as are produced in the human body in response to the malarial toxins (?) are quickly eliminated. "Acquired Immunity," by Dr. G. Archibald Reid. *Lancet*, 11th September, 1897.

† Inoculation for Tick Fever: Its Prospects and Problems. *Queensland Agricultural Journal*, Nov., 1897.

‡ No instance of a second attack produced by the injection of virulent blood has, so far, been recorded. Many such injections have been made by the writer into recovered cattle without obvious result.

§ Eighth and Ninth Reports of Bureau of Animal Industry, U.S. Dept. of Agriculture. Thirty-seventh Bulletin of Missouri Experiment Station. Report on Tick Fever by Queensland Commissioners, 1896. Queensland periodical literature, *passim*.

|| It is necessary to emphasise this fact because there are those, both in Queensland and America, who deny it. These persons are not always the most reticent in the community, and are unfortunately, as a rule, little influenced in their judgments by experimental evidence—or, indeed, by evidence of any kind. Even the striking object lesson of ticks and disease marching hand in hand into Queensland is lost upon them.

¶ Manson, speaking of the malarial organism (Goulstonian Lecture, No. I., 1896), says: "The individual *Plasmodium* gets into man designedly, and, this being so, we may be quite sure that just as provision is made in its economy for a passage into the human body, so provision is made in its economy for a passage out of the human body. Such a provision is absolutely necessary for all true parasites; otherwise, were this not the case, the extinction of the parasite, not merely as an individual, but as a species, would be inevitable on the occurrence of the death of the host." Precisely the same argument, of course, applies to the organism of tick fever.

** Goulstonian Lecture, No. II. *Lancet*, 21st March, 1896.

†† Hypotheses as to the Life History of the Malarial Parasite outside the Human Body. By Dr. Amico Bignami. (Translated from the Italian by Dr. Sandison Brock, of Rome.) *Lancet*, 14th and 21st November, 1896.

directly inoculated into man by the mosquito, an idea in support of which he adduces the analogous case of Texas fever in cattle being directly inoculated by ticks. Bignami's remarks are so extremely *apropos* of the subject we are now considering, that it will be well to quote his own words. He says:—

“As regards malarious infection the idea that insects, and especially mosquitoes, have an intimate relation with the mechanism through which man takes the fever has been started by many observers, particularly by some of the Americans. Laveran, who, as is well known, is the principal supporter of the water-conduction theory, notes the abundance of mosquitoes in marshy places, calling attention to the fact that the drainage of the soil, whilst it suppresses the fever, also suppresses the mosquitoes. He also calls attention to the possibility (without excluding it) that mosquitoes have a part in the pathogenesis of malaria as they have in that of filariasis, and, as believed by Findlay and others, also in the dissemination of yellow fever. Grassi and Feletti exclude this possibility without even considering it, because places exist infested with mosquitoes where one does not take the fever. The fact is known to all, but it is not sufficient to exclude the hypothesis that mosquitoes are the carriers of the infection. It would further be necessary to demonstrate that in the soil or in the waters of those places there exist malarial germs, of which these insects are only the vehicles and inoculators into man.* Besides this they recall a fact asserted by Calandruccio, that in the intestine of mosquitoes malarial parasites die without developing further. (A similar fact has also been observed in leeches.) But the observation of Calandruccio can be fairly opposed to those of Ross and the hypothesis of Manson, whilst, if I am not mistaken, it has no value against the hypothesis that man is inoculated with malaria by the mosquito. On the other hand, the knowledge, if it could be well authenticated, that there exist places in which malaria can be contracted notwithstanding the absolute absence of mosquitoes and of insects which could inoculate it, would suffice to exclude the hypothesis. But one has no authenticated information of such an occurrence. On the contrary, all authors speak of the abundance of these diptera in the malarial districts. Kelsch and Kiener, in their well-known treatise, do not even allude to the possibility of inoculation. They also exclude the water-conduction hypothesis. That the infection comes by inhalation through the lungs they have no doubt.

“Notwithstanding the authority of the observers cited, it has for a long time appeared, and still appears, to me that an attentive examination of the question which I have mooted above will not be wholly useless. If one admits the inoculation hypothesis, many facts which are difficult to explain by the theory of air conduction would find a simple and satisfactory explanation, and it is easy to demonstrate this. First of all, the fact, which we have already discussed at length, that malaria is not carried by the winds would be easily understood, knowing as we do how closely these diptera are bound to the soil on which they are hatched, and how averse they are to allow themselves to be carried away, hiding when the wind blows, in the ground, amongst the grass, or under the trees; also, when a sea breeze blows in the afternoon the mosquitoes of the Roman Campagna do not show themselves, and only when the wind has gone down at the setting of the sun do they rise in clouds everywhere and attack animals and men. That the evening and night hours are the most dangerous, on account of the facility with which fever is then taken, would be easily understood by anyone who knows the habits of this nocturnal dipter. That malaria only rises to a moderate height would also be equally intelligible, because the inoculating insect always flies near the ground. A satisfactory explanation would also be furnished of the great danger of sleeping in malarial districts, a fact of which the supporters of the air-conduction theory have never been able to give more than an artificial explanation.

* The same facts, *mutatis mutandis*, and the same reasoning apply to the well-known circumstance that ticks may be present in a locality without producing—at any rate, obvious—disease.

Anyone who has experience of malarious districts well knows a number of cases in which the patient attributes the fever that torments him solely to having slept a few hours in a place where several times he had perhaps remained while awake without harm. Three years ago I made, with my colleague, Dionisi, various excursions into malarious localities for the purpose of study, and more especially with the object of collecting from the inhabitants the results of their experience—an experience which one finds with difficulty in books. Many precautions which they take against the fever are taken, one would say, to defend them from the sting of insects. They avoid going out at night; they are very careful not to sleep in the open air; they hermetically close the windows—windows with badly fitting shutters, which might impede the ingress of insects, but certainly not of air and of the germs which it might contain. They take great care of their mosquito-curtain, making it of very close net, under which they sleep, thoroughly shut in, notwithstanding the great heat.

“It is interesting to remember that Emin Pasha never omitted to take a mosquito-net with him on his African journeys, and he attributed to this precaution his not having had fever, the malarial agent in his idea being a corpuscular substance of which he supposed the close net did not permit the passage. Nicolas, in his book on the Hygiene of Camps in Marshy Places, thus expresses himself on this question: ‘And the mosquito-net, well shut, is indispensable at night. Without attributing to the puncture of mosquitoes any relation whatever with the microbes of the fever, one may be certain that irritation by them produces sleeplessness and predisposes to the fever.’ On the estates and farms visited by us in the Campagna, the overseers, who are less frequently attacked by the fever than the workmen, protect themselves with great care from the bites of insects, especially during sleep. On the estate of Porto, near Finmicino, where a bad type of malaria prevails, and which I visited several times in company with my colleague, Dionisi, in the height of summer, we obtained the greatest amount of information about the habits of mosquitoes, and the results of the experience of the inhabitants on the way in which fever is caught. The greater number think that the fever is taken almost always during sleep. A very brief stay sometimes suffices—even one night. But ordinarily, even in districts very subject to malaria, a longer stay is necessary, so that the workmen who go on to the property at the beginning of July for the threshing commence to get ill as a rule eight or ten days after their arrival. On the other hand, those who go in September for the working of the ground often get ill more quickly—after only two or three days’ stay. Many have observed that in autumn after the rains the mosquitoes increase, and likewise the fevers, and, as the season advances, they disappear together little by little. Thus, collecting from the inhabitants (who are really much better informed about malaria than some medical men) the results of their experience, the conviction grows upon one that, if malaria were inoculated by mosquitoes into man, all the questions which I have put in a preceding paragraph would receive an adequate answer. Malaria behaves itself with regard to man as if the malarial germs were inoculated by mosquitoes.”

Bignami further on says: “It is known that those do not easily catch fever who inhabit the shepherds’ huts, which are made in the form of a cone, with the hearth excavated in the ground in the middle and with an aperture near the apex of the cone, so that on account of the smoke the inmates are free from insects. . . . It is known that carefully covering the skin keeps off the fever to a certain point: the inhabitants of malarious places never omit this precaution. I have heard it related by Professor Marchiafava that a Russian medical man he knew of considered it sufficient to cover the body completely, even to the face and hands, with woollen stuffs in order to escape the fever, and was so convinced of this that he himself always went to sleep in places subject to the severer forms of malaria protected by gloves and with a kind of mask over his face; and he never took the fever.”

NOMENCLATURE.

Considering the many particulars in which a resemblance or an analogy is discoverable between tick fever and malaria; considering also that the bovine malady, like the human, is of wide distribution, limited, as Smith and Kilborne point out, by latitude rather than by continents; considering, too, the confusion and inconvenience of having, for one and the same disease, a multiplicity of separate and distinct names which are, for the most part, meaningless or misleading, or have only a purely local or symptomatic significance*—one is tempted to inquire if some one general and appropriate name cannot be found. This is obviously a task for nosologists and etymologists, and would probably be easier to criticise than to accomplish.

The Queensland popular name of "tick fever," embodying as it does a distinct etiological indication, is probably the best name yet introduced. But the tick does not necessarily carry the disease,† nor is the disease necessarily a fever.‡ The relationships which have been mentioned might, perhaps, at first glance, suggest the term "bovine malaria," but that is at once negatived as implying an etiological identity which does not by any means exist. We desire to connote a true relationship without suggesting a false identity. The latter necessity excludes such words as "malaria" and "paludism," which have already another and quite well-defined meaning. We seem to need a word somewhat allied in significance to these, because—though they are both very much open to criticism on all grounds—they have the prestige of long and universal usage, and convey a very distinct pathological entity, correlation with which we desire to signify. The word "palustrism" is perhaps rather cacophonous and barbarous in construction, but it might possibly meet our requirements, since it does not appear to have been—at any rate, so extensively—employed in the sense of "malaria" and "paludism," and yet carries with it a suggestion of something the same general idea. If to such a word we added the generic term "Ixodic," to indicate the remote causative factor, we should have in the "double-barrelled" name—"ixodic palustrism"—a painful, but perhaps sufficiently descriptive, appellation.

* The following are some of the names that have been applied to this disease:—Redwater, Texas Fever, Southern Cattle Fever, Yellow Fever, Splenic Fever, Southern Cattle Plague, Hæmoglobinuric Fever, Spanish Fever, Red Murrain, Mexican Fever, &c., &c., &c.

† Many instances have been recorded where ticks have been present for many months without producing any obvious disease—which, at least, suggests that some cattle ticks do not carry the specific micro-organism.

‡ *E.g.*, in its chronic forms.

COLOURED PLATE
ILLUSTRATING REPRODUCTIVE FORMS OF
TICK FEVER ORGANISM,
AND
DESCRIPTION OF SAME.

Fig.1.



Fig.2.

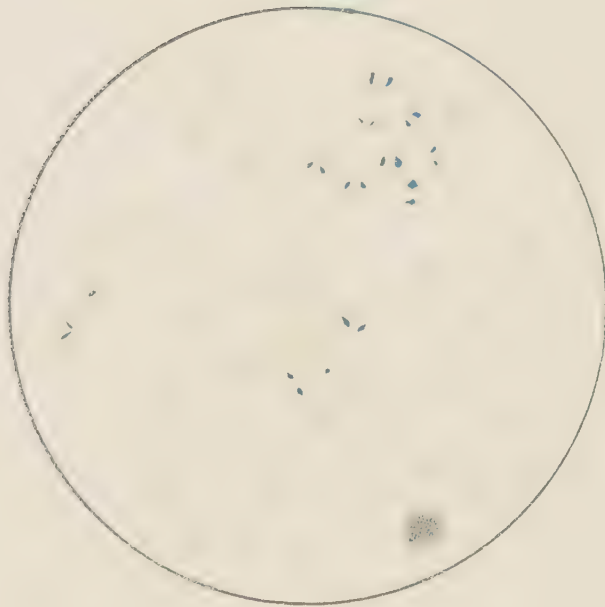


Fig3.

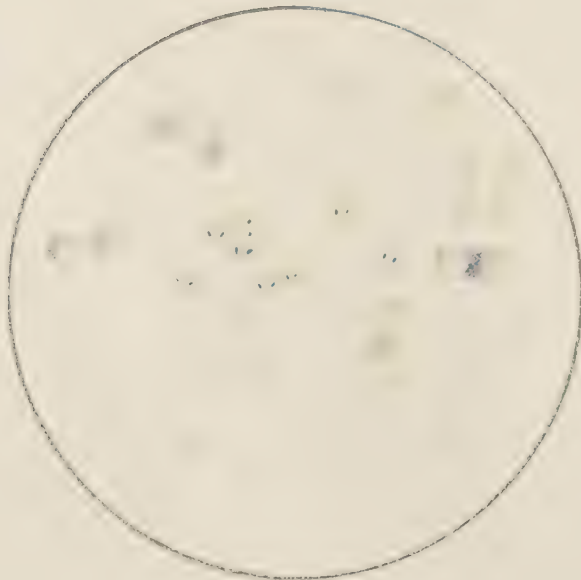


Fig. 4.

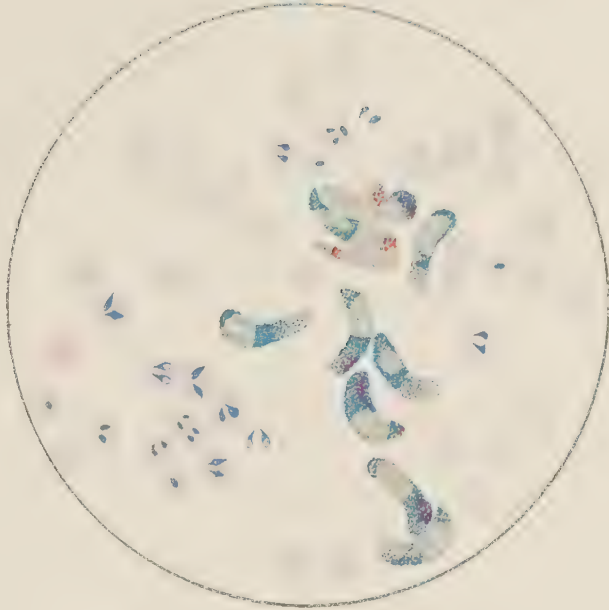


Fig. 5.



Fig 6.



DESCRIPTION OF PLATE.

- FIG. I.—Fresh specimen showing free amœboid bodies of various forms amongst the corpuscles. Leucocyte, containing refractory bodies, on the left. ($\times 1,000$.)
- FIG. II.—*Pyrosoma bigeminum* chiefly in the corpuscles, and some free; towards lower part of Fig. deeply stained round leucocyte.
- FIG. III.—Crescentic bodies with large nucleus (?); also some infected corpuscles. Towards the right is a cluster of *Pyrosoma* in the form of a crescent. (Stained with gentian violet, $\times 1,000$.)
- FIG. IV.—Shows grouping of crescents, and deep eosin coloured points; also, some corpuscles infected with *Pyrosoma*. (Stained with methyl blue and eosin, $\times 1,000$.)
- FIG. V.—Crescents further developed; some, still whole, containing young *Pyrosoma*; others rupturing and liberating those bodies; others, grown more or less spheroidal, appear to have lost the crescent envelope, and to consist only of the nucleus, round which some young *Pyrosoma* are still clustered. (Stained with gentian violet, $\times 1,000$.)
- FIG. VI.—To illustrate a case of mistaken identity. These bodies have nothing whatever to do with tick fever. They are spore cases of hyphomycetous fungus found growing on dead ticks. Spermatia may be seen to have been thrown out by some of them. (Unstained, $\times 1,000$.)

Tick Fever. ✓

REFERRING to and enclosing extract from an article on the important subject of tick fever, Dr. S. J. Richards, M.B., Ch.M., Mount Morgan, writes as follows to the *Rockhampton Morning Bulletin*:—I forward you herewith copy of the last *British Medical Journal* to hand, containing an interesting account of the investigations by two Italian scientists into the disease known to us in Australia as tick fever.

From the extract the disease is apparently not associated in Italy with the cattle tick. Possibly there the mosquito serves as in (human) malaria as the means of propagation of the internal parasite. And the direct statement that the native cattle are immune should afford us the greatest hope for the future of our pastoral industry.

The authors refer to the presence of the *Pyrosoma* within the red blood corpuscles. This I have not yet observed in the specimens of blood kindly forwarded me by Mr. Archer, of Gracemere, lately. I found the *Pyrosoma* in pairs and also singly; and varying in size from 6 diameters of a red blood corpuscle to the minutest dot discernable with $\frac{1}{10}$ inch oil immersion.

The communicability of tick fever by other means than the cattle tick would show the futility of relying, in a country inhabited by so many suctorial insects as Australia, upon quarantine as an efficient agent in checking the spread of the disease. It should, however, further stimulate careful judicious inoculation, which is on a par with the latest developments in bacteriological science.

I suggested some months ago, to a gentleman deeply interested in the subject, the use of quinine as a curative agent; but I have not heard from him since. I note that the Italian observers mention that "the disease is most favourably influenced by quinine." Let someone here give it a good trial and publish his results.

The following is the extract from the *British Medical Journal* of the 25th of December, 1897, mentioned by Dr. Richards:—

"Celli and Santori (*Centralb. f. Bakt.*, 1897, Nos. 15 and 16) report their investigations on a disease which attacks foreign cattle living in the Campagna, but spares those indigenous to the district. ✕It is characterised by fever, great anæmia, an enlarged spleen, and bloody urine, and is very frequently fatal. The authors found in the red blood corpuscles of animals affected by and dead of the disease a small body assuming two types, according to whether its movements were amœboid or from place to place in the corpuscle. Culture experiments failed, but on one occasion they succeeded in inoculating a healthy calf with the disease, and in demonstrating the foreign bodies in the blood during its continuance. They consider the bodies to be endocorpuscular parasites; they are occasionally pear-shaped, and may be double, whence Smith, of Texas, has given the name of *Pyrosoma bigeminum* to one of the stages in their as yet incompletely studied developmental history. Although in some severe cases the disease is accompanied by hæmoglobinuria, this is not a constant concomitant nor even a frequent one, so that the name of cattle hæmoglobinuria or hæmatinuria does not afford a characteristic definition. A rapid and certain diagnosis can, however, be made by the examination of the blood, whereby cases can also be detected which would otherwise escape observation. ✓The disease appears to be identical with that described by Babes in Roumania as cattle hæmoglobinuria; by Smith and others as Texas fever; by Krogus in Finland as hæmoglobinuria; and by Sanfelice and Loi in Sardinia as hæmatinuria. ✓When one considers the above-mentioned clinical characters, together with the characteristics of the parasite, the *post-mortem* appearances, the communicability from one animal to another of the same kind and race, and the further circumstances that the disease develops only in malarial neighbourhoods and seasons, and is most favourably influenced by quinine, its resemblance to human malaria is seen to be very marked. The authors propose, therefore, that it be henceforth known as cattle malaria."

Pisciculture.

THE BARRAMUNDI.

MR. G. L. PILCHER, Rockhampton, writes as follows on the barramundi, illustrated in the *Journal* of 1st January:—In the January number, 1898, of the *Queensland Agricultural Journal*, Mr. D. O'Connor recommends the acclimatisation of the Fitzroy barramundi in the Brisbane River, but I am afraid that Nature herself interposes some unascertained obstacle to the permanent success of the project. In 1872, the late Mr. John Jardine and myself sent some barramundi and other fish preserved in spirits to the Acclimatisation Society, which, together with some accompanying notes, were forwarded by them to Mr. Daintree, for the British Museum.

Dr. Günther, in acknowledging their arrival, wrote to Mr. Daintree as follows:—"The large specimen and three smaller ones, called the perch of the Fitzroy River, are properly referred by Mr. Jardine to the genus *Lates*. They are *Lates calcarifer*, a fish hitherto well known from the coast and fresh waters of the India and East India Archipelago. It is much esteemed in India for the table, and Hamilton states that specimens 5 feet long are not rare in the Ganges. You see this fish has a wide distribution, and I was so much surprised at its occurrence in Queensland, when I received the first specimens from the Fitzroy River in 1870, that I published a notice of it in the proceedings of the Zoological Society, 9th December, 1870. I know specimens of this fish from India, Java, Madura, Banca, Borneo, and Celebes. I shall place the large specimen in one of the public galleries of the British Museum; a smaller one will be made into a skeleton, and the other two I intend to transfer to other museums, as we possess already similar specimens. P.S.—I have given one specimen of the Fitzroy perch to the Oxford Museum, as a gift of the Queensland Acclimatisation Society."

From Dr. Günther's account it appears that few fishes have so wide a tropical distribution as *Lates calcarifer*, and, as they are found on the sea coast, in the tidal rivers, and the lagoons connected with them, there must be some natural cause which prohibits them from finding their way into the Brisbane River. I believe that they are found as far south as Bundaberg, but not lower, so that the temperature of the water may be the reason of their not being found as far south as Brisbane. I may here mention in connection with this idea that one of the most puzzling problems in connection with the barramundi is that in the Fitzroy it is never found in roe, and that no one has an idea as to where it spawns, whether in the sea, the river, or the lagoons. A fisherman named Hall, a most reliable and intelligent observer, who made his living for many years by catching fish in the Fitzroy, told me that, of the thousands he had taken, he had only known of two or three instances of it being taken with a roe; he described the roe as being large, shaped like "a pair of breeches," and as fine as a cod's roe (European). Now, how is this sterility of the barramundi in the Fitzroy waters to be accounted for? My own idea, which I only venture to put forward for consideration, is that the temperature of the water about the latitude of Rockhampton (23 degrees 24 minutes) is not sufficiently high to induce the fish to breed, though in other respects they can thrive well enough in it, and that their spawning grounds will be found somewhat farther North, where the temperature is higher during the breeding season. From Dr. Günther's list of habitats it appears to be a strictly intertropical fish; its northern boundaries being Calcutta and China, limits of

latitude which correspond very equally with that of the Fitzroy and Bundaberg, in the southern hemisphere. It would be interesting, and it should not be difficult to obtain reliable information as to which is the first place north of Rockhampton where the fish is found to carry a roe, or if it has so far never yet been found in spawn on any part of the coast.

To add to the confusion of names, there is a third fish, besides *Lates* and *Osteoglossum Leichhardtii*, not mentioned by Mr. O'Connor—viz., *Ceratodus Forsteri*—to which, in his first description of it, Mr. Kreft, of the Sydney Museum, gave the name of "Barramundi," which name it bears in scientific works to this day. I have the "Text Book of Zoology, 1894," beside me now, which, in noticing the two species of *Ceratodi*, says "that the former and best known species is known to the natives as the 'Barramundi' or 'Jeevine.'" The name "Gigantic Perch" of the Fitzroy, not "Giant Perch," was an accepted name for the fish long before Mr. De Vis' time.

Forestry.

FOREST CONSERVANCY.

By A. J. BOYD,
Queensland Agricultural Department.

PART 4.

THUS what I stated in my last article—viz., that the American system was utterly unsuitable for Queensland—will be apparent. Our timber areas are mainly located on the seaboard, from the Tweed River to Cape York, and they have a varying breadth of from 50 to 100 miles. Our inland forests are not continuous. They are broken by immense plains, and present no insuperable difficulties of supervision. The method adopted at the State forest on Frazer's Island is eminently calculated to show how a forest may be kept up as to its timber supplies, by fostering the natural growth.

The first planting of kauri pine on Boginbah Creek was on areas cleared entirely of undergrowth, when the young plants were placed thickly in rows with the object of subsequently thinning them out. At the second planting, a different system altogether was adopted. Lanes, about 8 or 10 feet wide and 1 chain apart, were cleared through the scrub, the young trees being planted in the lanes. The natural features presented in these lanes, being different from those when the first planting was made, afforded the young trees a better chance than when growing in the latter locality. But even here a large number made but little growth at first.

The system of lanes adopted by Mr. McDowall when the forest was under his charge is an admirable one, not so much for the purpose of planting as for a basis on which a definite system could be carried out, such as thinning out and clearing round the undergrowth, which has to some extent been done. In the blocks between the lanes where this thinning out and clearing away of undergrowth has been effected, there is a marked difference in the growth of the trees, compared with those which have been planted in the lanes. The young trees here have never been disturbed, and are growing under entirely different—that is, under natural—conditions; the clearing away of the vines and creepers merely giving more light and breathing space. This comparison clearly demonstrates that, under any future system of forest conservancy that may be determined upon, the question of undergrowth must not be overlooked, and it, moreover, confirms the opinion given by many on this point. Mr. McLean, Under Secretary for Agriculture, in his report furnished to the Minister for Lands in 1889, says:—"I wish to point out clearly, and to lay special stress upon the fact, that there is continually going on a natural process of reproduction in nearly all, if not in all, our forests where any quantity of timber has been cut down, much better, in my estimation, than could result from artificial means, and which can be fostered at comparatively small cost to the State, in comparison with entering upon an extensive system of reafforestation."

So marked was the difference in results from the two systems of treatment on Frazer's Island, that I instructed the ranger in charge to continue the process of clearing round the natural growth instead of planting. This is the true policy of forest conservancy in Queensland."



AGATHIS ROBUSTA. QUEENSLAND KAURI PINE.

That the system of natural reforestation can be successfully and inexpensively carried out in all our denuded scrubs, is evident to any person who has worked in, or who has travelled through, such places. It is well known that all our valuable timbers are being reproduced naturally in large quantities, and, wherever timber has been felled and removed, numbers of young trees are found springing up.

They are also found alongside the tracks cleared by the timber-getters. All, therefore, that is required is that these beds or natural plantations of young trees should be sought out and cleared round, by which process the quantity of timber could be naturally largely increased, for where one tree has fallen four or five would be found on the same site.

The work done at Frazer's Island during 1892 is represented by clearing away vines and undergrowth about the natural plants situated in the blocks between the lanes. The number of these young trees which received attention was :—

May	...	...	...	...	...	4,082
July	...	...	...	...	...	3,895
August	...	...	...	...	...	2,141
September	...	...	...	...	...	4,025
October	...	...	...	...	...	3,063
November	...	...	...	...	...	2,434
December	...	...	...	...	...	5,311
Total						24,951

The lanes, which are, as stated, one chain apart, extend for a distance of nearly fifty miles in the aggregate, and the number of young kauri pines planted in the lanes, clearings, and through the scrubs amounted in 1892 to 71,550; there had also been 26,154 natural plants cleared round, giving a total in that year of 97,704 young trees to be kept clean and attended to.

Very little additional planting has been done of late years, as the scrub at Boginbah is almost all already planted, and the ranger has all he can do to keep the large number of trees in the plantation free from fallen scrub and vines.

At Yankee Jack's Creek Plantation there are eleven miles of lanes, and 28,518 young trees naturally planted have been cleared round and fostered.

If all these trees were left till they attained a diameter of 20 inches, they would supply one sawmill such as I before described, cutting 100,000 feet weekly, for about twenty-six years. If allowed to grow to 24 inches, they would keep it in full work for about forty years; whilst, if left for five years longer, they would form a regular supply for the mill for ninety years.

As the kauri increases about 3 inches in diameter annually, it would require about four years after topping the scrub to attain to 20 inches. Another two years would increase its yield of timber by 500 superficial feet; and an additional five years' growth would add 12 inches to its diameter and 2,024 superficial feet to its measurement. In all, about fifteen years would be required to bring about the last result.

It will thus be seen of what enormous importance to the timber industry is forest conservancy. True, we have many thousands of acres of mountainous forest and scrub covered with grand eucalypti, cedar, beech, hoop pine, bunya pine, &c. (the latter protected from the timber-getter by legislative enactment), but the time must inevitably arrive when these timber lands will be shorn of their treasures unless steps are at once taken to protect them. There are millions of young trees ready growing for the service of man, if man will only allow them to do so by protecting and assisting them. Once the forests have been placed in proper working order, and under good regulations, Queensland will have no need to import—she will have perpetual supplies for her own use, and probably will be able to export, especially the more valuable timbers.

There are many woods in our scrubs of which, owing to popular ignorance of their value, no use is made, with the exception of crow's ash, yellow-wood (of two kinds), silky oak, cedar, beech, and pine, with a little brigalow and rosewood. No note is taken of the great mass of scrub timbers, many of which are of great height and girth, as, for instance, the hickory, tulip-wood, bean-tree, scrub ironwood, and many others, which, some day, will represent capital. Not many persons unconnected with the timber trade know even of the existence of a timber called "penda." This is an intensely hard wood, which is found in many Southern districts, and has been found suitable for wooden tramrails and for other purposes requiring great hardness and durability.

In former days it was customary to save the largest yellow-wood trees, when clearing the scrub for farming purposes, but it was found that, when once the sheltering scrub was destroyed, the single trees left standing died off in time, and, as there was practically no market for this timber, it disappeared with the rest of the assets.

Mr. F. H. Newell, Chief Hydrographer to the United States Geological Survey, remarks: "The first necessity of the pioneer in the West is water; next to this, grazing for his animals, and then wood for fuel and for purposes of construction. As settlement progresses, the demand for wood increases—more houses must be built, more fences erected, more fuel consumed, and, as mines are discovered and worked, wood in great quantities is called for. The demand is ever growing, and many industries are dependent for success on the ability to obtain timber or firewood at low prices. With the great distances between centres of population and the expense of transportation in our sparsely settled West, the utilisation of many resources is closely connected with the ability to get the necessary wood near by, and, with the relatively small areas of forest, it becomes important to perpetuate the wooded areas so as to provide for the needs of the near future."

As owners of the forests, the people of Queensland should, from motives of prudence, see that these resources are not wasted, and still more, as owners of those tracts of land, dependent for utilisation in greater or less degree on the forests, should ever make the most strenuous exertions to indefinitely preserve the latter.

We must grant that whilst a farmer requires no incentive to keep his land in a state of fertility, beyond the certainty that if he does not do so by manuring, draining, fallowing, &c., he will end by owning an impoverished soil which will not yield him the means of gaining a livelihood, he requires a very great incentive to induce him to keep up the supply of timber in forests in which he only has a passing interest. He takes out what timber he requires for his building and fencing, and then, regardless of posterity, either destroys the remainder, or at least makes no effort to perpetuate the supply by planting or by nurturing the natural growth. Most people are ready to make an outcry against the destruction of our forests, but, again, these same people gladly shift the burden of doing so on to other people's shoulders. In this colony it has been clearly shown how the business should be carried out—viz., by protecting the naturally growing young trees in forest and scrub lands, which have been carefully examined and classified by competent men. The work would necessitate some considerable expenditure; but would that expenditure not be recouped again and again by providing constant supplies of timber, for which otherwise we shall have to pay heavily to import from other countries? But can even this last resource be confidently reckoned on? Take Mexico as an example. The effects of forest destruction in Mexico are painfully apparent. As with us, the forests have been destroyed for the purpose of cultivation on the hillsides, and the results are, as I pointed out before, that the soil of thousands of acres of such land is carried down by floods into the plains, which are in their turn destroyed for cultivation purposes by being

buried under masses of rock and gravel. Every year the roads and railways are damaged to an enormous extent, but the indolent Mexican will not rouse himself to the exertion necessary to prevent this annual destruction of public and private property.

How is it that men cannot take a lesson taught over two hundred years ago by William Penn, the founder of Pennsylvania? He was far-seeing enough to issue an order that, of every six acres held by a farmer, one should be retained in its virgin condition of forest, and anyone setting the woods on fire was severely punished.

It is, I consider, a duty owed by every citizen to the State, to use his utmost endeavours to prevent the extinction of our forests, and to support all legislation having that end in view. It must be remembered that the welfare of the colony and the happiness of its people depends largely upon this question. We have at present barely 500,000 people here; and when we look round and see what havoc has already been wrought by a mere handful of these as workers, we may well pause to consider what effect will be produced when the population reaches, as it will ere long, to 1,000,000 or more. We are woodpaving our streets; we are building railways and railway carriages and trucks, and are constantly renewing railway sleepers, bridges, &c.; buildings are daily increasing; the demands for firewood are insatiable—whence is all the requisite timber to come when we have exhausted our supplies? If it cannot be got from other countries, then it means that the actual existence of the colony is threatened. It may be said that America and Canada can supply our wants. I have already shown that, unless great care is exercised, those countries will have difficulty in supplying their own requirements.

The opinion of the president of the Arizona Lumber Company at Flagstaff, conveyed to the governor of the territory in 1893, is in accord with what I have written. He also showed that in Arizona the sawmills cut 24,000,000 feet annually, and only 6 to 7 per cent. of the logs coming to the mills yield first-class material.

In 1885 a member of the American Congress said: "With the forests all dead and gone, man will not long survive on the American continent."

When such fears are expressed in a country where some of the States are so sparsely peopled that, as in Nevada, there is only one person to two and a-half square miles, in Idaho one, and in Montana and Wyoming less than one inhabitant per square mile, we in Queensland may well begin to look ahead. We reckon barely one person per square mile as yet, but our forests are mere woods compared to those of America and Canada, and, unless we begin at once to preserve them, the day is not far distant when those who to-day are living will learn to rue their culpable supineness.

General Notes.

AGRICULTURAL SOCIETIES.

DR. YOUNG, on opening his lecture on "Tuberculosis" to the Ulladulla Agricultural Society, alluded to agricultural societies and gave some sterling good advice to his audience. He said: "An agricultural society should really be a farmers' mutual benefit society. Meetings should be held regularly, papers read and discussed, and some real practical work done. Surely we can all help each other in various ways connected with farming. One man believes, for instance, that certain breeds of cattle and pigs do better than others. Well, let him stand up and tell us why; he must have good reasons for thinking so, and why not impart the reasons to others? Another says you should feed your stock on certain grasses and crops to obtain the best results. Well, why not let us have a discussion on the matter? We are willing to learn, and besides teaching others he might be able to pick up a few fragments of knowledge for himself. And in many other respects the society might be made practically useful through these meetings." To this we would add: If you have anything worth writing about, any new idea, any results of experiments in agriculture to record, give the information to the world by means of the Press. Many farmers will not write because they have an idea that they cannot write sufficiently well for the public. This is a very mistaken idea. Let us have the ideas; it is our business to put them into readable shape. Diamonds are found in a rough unpolished state. The diamond polisher gives them to the world in a finished state. So, great ideas are often contained in a rough letter which the editor treats as the lapidary treats the stone: he gives it to the world—polished.

CANAIGRE AGAIN.

IN tanning hides, the sooner natural decay, which begins with the death of an animal, can be arrested, the better will be the leather. A hide is heavily salted and sent to a tannery, where it is immersed in water, that particles of flesh adhering to the inner side may be scraped away. It is then soaked in lime water twelve hours to remove the hair. After being scoured and depilated by a machine, it is ready for the tanning fluid. It has been necessary to allow it to lie in a bark solution for three months, being moved, drained, and manipulated many times during the process. If the solution of tan bark is too strong, the hides may be destroyed. For years scientists have experimented with different substances, hoping to shorten the time necessary for the perfect preparation of hides. Recently it has been found that canaigre, or sourdock, possesses properties which show that it is indicated by Nature for preservative purposes. It is impossible to burn leather in its solution. The cells of a hide will absorb enough to tan it in twelve hours, and will take no more. In a few hours, varying with the substance to be treated, the tannic acid in the canaigre will have done its work, saving three months' time and a great deal of labour. The cost of planting, cultivating, irrigating, and harvesting an acre of canaigre is estimated at \$16.50. The yield is from 12 to 20 tons per acre on new land, and rises with cultivation. The returns vary from \$65 to \$75 per ton, sliced. Drying shrinks the product two-thirds, but it is said that the producer can count on a clear gain of \$200 per acre.—*Chicago Inter-Ocean*.

SOUTHBROOK WHEAT HARVEST.

THE *Toowoomba Chronicle* publishes the following cheering notes from its Southbrook correspondent on the harvest in that district:—

Early in the season there was a lot of speculation as to the probable yield. The effect of the rust was very much feared, but, while considerable damage was done, yet there have been good yields, and there is every encouragement for the farmer to sow wheat extensively for the coming season. I give a few of the actual results on the north side of the railway, the south side being very similar, say, from 4 to 8 bags per acre. Mr. W. Gwynne takes the lead with a yield of fully 8 bags per acre all round, each bag weighing $4\frac{1}{2}$ bushels, thus giving 36 bushels per acre. Thus we have: Mr. W. Gwynne, 320 bags, 40 acres; Mr. W. Farquharson, 225 bags, 40 acres; Mr. F. Farquharson, 53 bags, 14 acres; Mr. Quinlan, 140 bags, 18 acres; Mr. J. Stower, about 7 bags per acre; Mr. W. Blacklock, 240 bags, 40 acres; Anderson Bros., 330 bags wheat and barley, 80 acres; Mr. D. Mackintosh, 170 bags, 30 acres; Mr. T. Dwyer, 140 bags, 22 acres; Mr. J. Heffernan, 170 bags, 50 acres; Mr. T. J. Jenkins, 240 bags wheat and barley, 50 acres; Messrs. Yorke Bros., 150 bags, 23 acres; Mr. Noonan, 60 bags, 12 acres. Anderson Bros. are to be congratulated in getting the prize of £10 10s. for their malting barley, which, I understand, was the best exhibited at the late farmers' show at Toowoomba. It must have been good, for they obtained 5s. per bushel for the whole of it (107 bags), while others only got 4s. 6d. and 4s. 8d. Nearly the whole of the wheat has been sold to the Dominion Company at 4s. per bushel at Southbrook.

Returns such as above quoted should be very inspiring to the selectors who have lately taken up so much of the Headington Hill lands, where the soil is equally as good as the Southbrook soil.

A HEAVY DEAL IN WHEAT.

AMONG the great commercial transactions of 1897, the attempted "corner" in December wheat at Chicago stands out in prominence. At the head of the speculative enterprise is Mr. Joseph Leiter, who bought 6,000,000 bushels of wheat for December delivery. This great deal was expected to have embarrassing results, as it was supposed that the wheat could not be obtained in time for delivery, and that, consequently, Mr. Leiter would be able to run the price up to an extravagant rate. As it was, he succeeded in forcing the price up to 104 cents a bushel at one time, or 13 cents more than the price for May wheat. But he was encountered by an opponent of vast resources, Mr. Philip Armour, who, in the face of great difficulties, succeeded in obtaining the enormous quantity of wheat to deliver. Agents were sent to Duluth, Minneapolis, and the north-west to buy wheat of the requisite grades; arrangements were made with railway companies, and every available steamship was chartered. As ice was forming on the great lakes when there were 2,000,000 bushels of wheat at Duluth, which had to be conveyed to Chicago by water, half-a-dozen steam-tugs were engaged to break through the ice, and to continue moving up and down in Duluth Harbour, and others in the Soo Canal, to keep a channel open until the grain fleet had got out. Thus, by rail and water, wheat was poured into Chicago until Mr. Leiter's great deal was covered. Then the chief question of interest to speculators was as to what Mr. Leiter would do with the wheat. He declared his intention of shipping it promptly to Europe, and a great deal of it has already been exported; but there is still a large quantity to dispose of, and, so long as it remains, it will have a disturbing effect upon the market.—*Standard*.

THE WORLD'S WHEAT CROPS.

FOR agriculture in most foreign countries and British colonies the year has been more or less unfavourable. The wheat crops of France, Italy, Austria-Hungary, Russia, and the Danubian countries proved much smaller than those

of 1896; Argentina was troubled with frosts, floods, and locusts, which have reduced a highly promising crop to one of less than average dimensions; and the Australian crop has been once more badly injured by drought. The United States and Canada are the only exporting countries which have produced full crops at present. India, although suffering from famine during a great portion of the year, proved, with the help of Burma, self-supporting in respect of food, and the summer and autumn food-grain crops turned out well, while wheat was sown and started under the most promising conditions. The wheat supply of the world, during the latter part of the cereal year, will be greatly affected by the production of wheat in India, to be harvested from February to April. But, even if India produces a full crop, the wheat supply of the world for 1897-8 will be about 16,000,000 quarters less than the deficient total of 1896-7, and fully 26,000,000 quarters less than the normal consumption of the cereal year. As the rye, maize, other grain crops, potatoes, hops, and fruit crops have also turned out more or less deficient generally, it is clear that 1897 must take rank, for the world as a whole, as one of the lean years of the century.—*Standard* (London).

THE PRICE OF WHEAT.

WITH respect to the prices of agricultural products, the year opened with falling wheat markets, which caused much disappointment and surprise in the face of an acknowledged shortness in the production of the preceding harvest of the world in relation to the consumptive demand. There had been a considerable advance in the price of wheat in the late portion of the autumn of 1896, in consequence of the famine in India, the destruction of a great portion of the Argentine crop by locusts, and the lack of a surplus in Australasia. But a reaction set in with the winter lasting till the middle of May, when the scarcity of wheat was so keenly felt that a recovery was inevitable. The average price in the first week of January was 30s. 6d. a quarter, and by the middle of May it was only 27s. 11d., after sinking to 26s. 6d. in the third week of April. The advance was a small one when it first occurred, and there was a collapse during June, which ended with the average at 27s. a quarter; but after July began there was an advance, in spite of fluctuations, until the middle of November, when the average stood at 34s. Then came a slight reverse, which, however, has now been recovered, the average for the last week of December having been 34s. 4d. The range of weekly averages for wheat up to the fourth week of December was from 26s. 6d. to 34s. 4d. The average for the year comes out at 30s. 1d. per quarter, as compared with 26s. 2d. for 1896, 23s. 1d. for 1895, and 22s. 10d. for 1894.—*Standard* (London).

WHEATGROWING IN VICTORIA.

A VICTORIAN farmer, writing to the Melbourne *Argus*, says:—New wheat started in our local markets at 4s. 6d. per bushel, a price, or a little less, we would have been willing to sell at. The first few loads brought 4s. 6d., but as soon as the wheat began to arrive in any quantity the price was brought down to 3s. 8d. Then the question with the farmer was: Where will it stop, or how to stay the market? The only thing we could do was to hold last year. We lost nothing by holding for a time; in fact, those of us who can must hold to stay the market. We have too many speculators on the scene. If we do not hold we sell at their own price. Hold for a month or two, rig the market to force prices up, sell, and make the profit the farmer should get. When I tell you, sir, that there is no profit whatever to the majority of the farmers for the past three seasons, but most of them have suffered heavy losses, I am sure you know I speak correctly. To be honest, farmers must try and get a somewhat fair price for their wheat, otherwise they cannot pay their just debts. In many cases it is not actually the farmer's wheat; he simply is the person in charge, to do the best he can to pay his creditors. The question I would put is, "Should there not be a unity between the millers and farmers?" taking the seasons

when there is but enough for home consumption. If the millers would say that they would keep the Melbourne price at from 4s. 6d. to 5s. per bushel, the farmers would then know that it would be useless to expect more than 5s. in Melbourne. I think it would rule all our local markets, and do away somewhat with speculators, who buy from the farmers and hold to the detriment of both millers and consumers. Thousands of our farmers have not taken off more than 3 bushels per acre. That, at 4s. per bushel in the local market, would mean 12s. per acre; at least a half bushel must be kept for seed, which leaves 10s. per acre for ploughing, sowing, stripping, cleaning, bags, twine, oil, and the too many etceteras, and carting to market. I for one, who have farmed for forty years, and can still farm as cheaply as most men, say, and I am sure, that it cannot be done for the money. That is the reply to the great question, Why do we hold?

Late advices state that many of the Victorian farmers are shipping one-tenth of their grain to London.

The *Australasian* comments thus on what farmers who are exporting wheat to London may expect. The matter works out thus: In selling a cargo of Australian wheat afloat, the custom is to quote a price per quarter of 480 lb. = 8 bushels, cost freight and insurance, which means that freight and insurance have to be deducted to arrive at the net return to the shipper, whilst landing charges on arrival have to be paid by the purchaser.

Assuming for the purpose of calculation that 37s. 6d. per quarter of 480 lb. c.i.f. could be realised, and assuming that a vessel could be secured at a rate of freight of 25s. per ton (although, owing to circumstances, 27s. 6d. might have to be paid), the net return may be arrived at as follows:—

	s.	d.	s.	d.
Price realised per quarter	...	...	37	6
Less Freight at 25s. per ton	5	4½		
„ Insurance, sampling, and general superintendence of loading, and commission at 2½ per cent.	1	7		
			6	11½
Net return			30	6½

The net return is equal to about 3s. 9¾d. per bushel at the port of shipment. But the return is subject to fluctuation, according to the price realised in the world's market, and according to the rate of freight which might have to be paid.

Every 6d. per quarter rise or fall, in the London market, means ¾d. per bushel more or less in the net return; and every 2s. 6d. per ton extra in rate of freight means ¾d. per bushel less in the net return.

With regard to quality, it would obviously be necessary to pick the sample carefully.

COMBINATION OF VICTORIAN WHEATGROWERS.

THE agricultural reporter of the Melbourne *Leader* writes from Numurkah:—Seldom has a movement among the farmers been taken up with equal spirit and determination to that now in progress throughout the Goulburn Valley in connection with combating the wheat “bears.” The *Leader* pre-harvest estimate, published as early as 24th November last, showed that not more than about 100,000 bags of wheat could possibly be exported over and above the quantity required locally for food and seed. The complete harvest has now proven that estimate to be rather under than over the mark, with the additional important fact that there are no old stocks held over from the previous year. The note of warning for the farmers to hold off the market, so as to prevent the usual cornering of their hard-earned produce, at the expense of the great bulk of growers, in order to enrich a few large operators,

was promptly responded to, with the result that recently a struggle has set in, and the friends of the speculators were sanguine that sellers would not be able to hold out. The happy idea hit upon then, however, by Mr. J. S. Mortimer, a leading farmer of this district, that each grower should agree to contribute 10 per cent. of his wheat for immediate shipment, has caught on like wildfire, and now from one end of the Valley to the other the response on the part of the farmers has been nothing short of enthusiastic. Letters from the agricultural societies at Tatura and Nathalia have already been received, announcing signed agreements by the farmers to such an extent that those two centres, together with Numurkah, are themselves already prepared with well on for 10,000 bags. Mr. Mortimer has proceeded to Melbourne to arrange preliminaries, and he telegraphs:—

“First shipment will leave in about ten days; arrangements made through Goldsbrough, Mort, and Co.; freight, 17s. 6d. per ton, and all consignments fully insured; liberal cash advances made immediately upon consignment. Get as many additional subscribers of 10 per cent. of their wheat ready for first shipment, and a second is arranged for in about a fortnight or three weeks after the first.”

Since the Tatura and Nathalia letters came in, meetings at Cobram, Katamatite, Shepparton, and other centres have been held, at which lists are reported as being numerously signed, so that, when the movement spreads to other wheatgrowing areas throughout the colony, it is anticipated that a sufficient number of farmers will very soon be found to make up, on the 10 per cent. basis, the whole of the 100,000 bags surplus.

IMPROVING THE MILK YIELD.

A WRITER in the *Southern Farmer* says that his cow gives all the milk that is wanted in a family of eight, and that from it, after taking all that is required for other purposes, 260 lb. of butter was made last year. This is in part his treatment of the cow:—“If you desire to get a large yield of milk, give your cows every day water slightly warmed and slightly salted, in which bran has been stirred at the rate of one quart to two gallons of water. You will find, if you have this daily practice, that your cow will give 25 per cent. more milk immediately under the effects of it, and she will become so attached to the diet as to refuse to drink clear water unless very thirsty; but this mess she will drink almost any time, and ask for more. The amount of this drink necessary is an ordinary pail at a time, morning, noon, and night.”

FROZEN MILK.

THE latest use to which freezing has been applied, so far as food products are concerned, is the freezing of milk. It is sold in bricks of different sizes, and warranted to be pure and sweet. Belgium's Government is to subsidise the industry to the tune of £10,000 a year, while in Copenhagen a company has been formed and arrangements have been completed for the regular export of frozen milk. The necessary plant has been erected, and contracts have been made already for the delivery of 110,000 lb. a week, which will be sent to all parts of the world in bricks or blocks like ice.

THE Danes and Swedes have opened up a new industry in the shape of exporting milk in a frozen state. The milk of a certain district is brought into a common centre, where it is pasteurised at a temperature of 167 degrees Fahr. It is then frozen at 14 degrees Fahr., and the blocks of frozen milk are placed in casks of double the capacity of the blocks. The vacant space is filled with milk which is kept cool by the slowly melting blocks, and which cannot be churned into butter by the violence of vibration during transport. Milk thus treated will keep for at least twenty days, a period quite long enough to ensure its arrival in England, France, or any other European

country in good condition. Seeing that the frozen milk will keep sweet so long as the blocks are unmelted, it would be reasonable to suppose that milk, kept in a frozen state in the cool chamber of a steamship, would keep for a much longer time, and that thus, wherever a good market could be found, milk could be profitably supplied.

TO KEEP A SMALL DAIRY COOL.

INSTEAD of boarding up the gable ends of the building, close them with battens 3 inches apart. Nail canvas over the battens, and on a small platform above place a kerosene tin full of water. Over the edge of the tin hang a bunch of woollen rags, reaching to the bottom of the water and falling over the canvas to a greater length than the ends lying in the water. The rags then act as a siphon. The water is drawn up from the tin, and constantly drips on the canvas, keeping it always moist. As a breeze blows through the wet canvas, the temperature inside the building is reduced by many degrees.

IRISH HONEY.

AMONGST the many beneficent efforts of the Irish Congested Districts Board was an attempt to induce the Irish peasant to grow honey, and to this end an instructor was sent who had authority to make loans to residents willing to keep bees. It was, however, soon seen that the Board would need to help the beekeepers to sell the honey as well as buy the bees, and, accordingly, those who were willing were invited to send in their honey packed in boxes provided in Dublin. A building was also fitted and prepared for its reception until a sale could be effected. To save trouble it was resolved to sell the whole in one lot if possible, and Mr. Lipton was invited to become the purchaser. He at once agreed to the price, and offered to take all the section honey, subject to inspection for quality. This was agreed to, and his agents and packers visited the Board's store, with the result that they were able to take all without rejection of any on the score of either quality or packing. This is a great boon to the peasantry of Donegal, Mayo, Galway, and Kerry, while the slump purchase by Mr. Lipton greatly simplifies the cost of marketing. Should this venture of the victualler prove successful, it will be a good thing for the beekeepers in the congested districts. The greater part of the honey is from white clover, but a considerable proportion is characterised as most fragrant heather honey from the moors and mountains of the West.—*Scottish Farmer*.

UTILISING CORNSTALKS.

YET another method of turning cornstalks to account is known as the "Marsden Process." The process consists in extracting the pith, after which the remainder of the stalk is desiccated and granulated. As fodder for stock, the prepared cornstalks are said to have proved of great value.

HOW TO GROW LARGE MELONS.

A VERY simple method of watering and at the same time manuring melon vines is to sink a cement or bottled ale-cask a little over half its own depth in the ground. Then throw up the soil against the uncovered part of the cask, thus making it the centre of a gradually sloping mound, much like a scrub turkey's nest. Fill the cask with stable manure. Sow the melon-seeds outside and at a little distance from the cask. Every day or every second day, when the plants have begun to grow vigorously, water the manure in the cask. The liquid passes between the staves, and thus fertilises the plants. A distinct advantage of this process is that during dry weather, when surface watering would only result in baking and caking the soil, the plants draw moisture and nourishment from below, and thus the soil round the roots is kept constantly moist.

TO MAKE ROSELLA JAM.

PICK the red calyx from the seed-pods; boil the latter in sufficient water to quite cover them until the jelly is extracted, and they look dry. Strain them, and weigh the liquor and the red fruit. Then boil the fruit in the liquor until it is tender. Add as much weight of sugar as there was of liquor and red fruit before the second boiling, and boil again until it becomes jelly.

This is a milder jam than when the seed-pods are not used, but not so good a colour.

Boil the red fruit in sufficient water to cover it. When tender weigh it. Add equal weight of fine white sugar, and boil till it sets.

PICKLED OLIVES.

STEEP the unripe fruit in a lye of water and a little quicklime; change it every day for three weeks. Then use pure water only for a few days; then bottle in salt brine.

TO COOK A HAUNCH OF KANGAROO—VIZ., LEG AND LOIN.

SHORTEN the joint by cutting the knuckle close up to the meat; then wrap it up closely in a large sheet of paper to keep it clean. Get some clay and work it down well with water till in a proper state to make bricks; roll it out to about 2 inches in thickness, and enclose the joint wrapped up in the paper in the clay working the clay up close so that there is no room for the steam to escape, and bake it in a good oven for ten hours. In fact, it should be cooked similar, to venison, but requires longer time to make it tender.

Forequarter should be slightly salted and then stewed for several hours, being very sinewy. The tail makes excellent soup, treated and flavoured like oxtail, but requires a much longer time to cook. The haunch is best served cold, being left to cool with the clay round it untouched after it is taken out of the oven; but if required hot, with made gravy, as with hare. English gipsies are said to cook their food in the hot embers, previously rolled in clay. The above experiment for cooking the haunch has been proved in Queensland, and the meat was eaten to the last morsel and considered as much superior to beef and mutton as venison in England.

TO SALT A PIG.

THE meat must be quite cold before pickling. To each score of pounds allow 10 lb. of common salt, half-an-ounce of saltpetre, half-an-ounce of sal prunella, and half-a-pound of foot sugar. Pound all these well together, and when well mixed get your man to lay the cut-up pork in a flat trough, and well rub in the mixture, taking particular care to rub the salt well near the bones. Do this rubbing and turning for ten days, each day putting the pieces from the bottom of the trough at the top. Let the pork stay in this pickle for three weeks, turning it three times each week. Hang it up to dry, and smoke it for six days on a rack over smouldering oak sawdust. Keep in a cool, dry place.
—*Australian Agriculturist.*

A CURE FOR MANGE IN HORSES.

BOILED linseed oil, sulphur, and kerosene, equal parts: First mix the oil and sulphur, then add the kerosene, and mix well. Applied with a hard stubby brush. Also, a teaspoonful of carbolic acid to a pint of lard, stirred in and well mixed.

BRITISH TRADE WITH THE COLONIES.

THE Australian colonies have an idea that they would like to win the English markets from the foreigner. Well, more power by that same, and may they have all manner of success, for sure, if they do not freeze out the foreigner, they are very likely to freeze out the unlucky Britisher himself

and his friend the Irishman. In 1891 there were 945,575 dairy cows in the three principal Australian colonies given over to dairying; while in Canada there were 1,857,112. The Australian output in butter then was 23,000 tons, and the Canadian 51,700 tons; while as regards cheese, the Australian produced 6,700 tons, and the Canadian 51,000 tons. Four years later the figures had bounded up. There were 1,100,000 cows in Australia, and 1,950,000 cows in Canada. Australia made 36,000 tons of butter and 11,500 tons of cheese, and Canada made 52,000 tons of butter and 68,000 tons of cheese. These colonies mean to do greater things than these, and their hopes are centred on the purchasing power of the United Kingdom. In 1896 that valuable asset in the universe imported 151,897 tons of butter valued at the handy sum of £15,344,000, and 112,227 tons of cheese, valued at £4,900,000, or altogether about 264,124 tons of dairy produce, worth £20,244,000. Of this stupendous sum the colonies got £4,130,000, and the foreigner sent 184,284 tons, and got £16,114,000 of this empire's hard-earned money. Very good. The colonies are advised by Mr. Samuel Lowe (Messrs. W. Weddel and Co.) to capture this or the greater portion of it, at least to reverse the balance of parts. They can do this, he says, by improving their dairy herds—(very good, Mr. Lowe: that means that they must buy Ayrshires and milking Shorthorns and Jerseys)—adopting a system of winter feeding, and getting square with the British public; confining the butter and cheese manufacture entirely to the factory system; making a careful study of bacteriology, and adopting its latest discoveries; adopting universally the principle of pasteurisation; and, finally, establishing experiment stations and dairy schools all round the place. This is an ambitious programme. If carried out in its entirety, and all its ambitious aims realised, a result might be achieved not in the contract: the home producer might find his last state worse than the first, because the foreigner, whatever happens, must send his surplus produce here—he has no other market, and he cannot eat it all. Mr. Samuel Lowe was not reassuring to the British farmer, and if I were the latter, and believed Mr. Lowe, I would take good care to tak' a cheap farm.—*Standard*.

AGRICULTURAL AND HORTICULTURAL SHOWS.

THE Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Show Reports.

DRAYTON AND TOOWOOMBA AGRICULTURAL AND HORTICULTURAL SOCIETY'S SHOW.

THE always interesting show of this society, which should have been held on the 12th January, was postponed, owing to the continued inclement weather, to the 26th January. The exhibits were numerous and of excellent quality, especially the fruit, vegetables, preserves, pickles, and wine. Vegetable marrows were very much in evidence. It seems a pity that in the case of such vegetables six should be required to be exhibited in each entry. This must debar many small growers from showing perhaps finer specimens than were staged. The owner of a small garden might be able to find three specimens worth showing, but cannot enter them owing to the regulations requiring the larger number. The same may apply to the quantity for entry of cucumbers, peas, beans, &c. We do not particularise the exhibits, as all details are recorded in the local journals, but mention must be made of the excellent exhibit of farm produce and of preserves made by Mrs. Tardent, from the Westbrook Experiment Farm, in charge of Mr. Henry Tardent. These, together with a similar exhibit from the Hermitage Experiment Farm by Mr. Ross, were subsequently shown at the Exhibition on the 2nd February of the Horticultural Society of Queensland and the Queensland Fruitgrowers' Association, when they attracted special attention.

We often hear it remarked that Queensland bottled fruits, pickles, jams, &c., are not equal to the imported articles; but anyone who has seen and tasted the beautifully got up goods shown by Mr. Roessler must admit that for freshness, purity, colour, and taste they are equal, if not superior, to those imported from Europe.

Considering that the district round Toowoomba produces excellent potatoes, we were surprised to see so few exhibits of this product. The same may be said of the fruit exhibits. A district in which twenty-two cases of cherry plums have been gathered from one tree in a single season should be able to present a magnificent array of fruit. Flowers were not numerous, but Mr. Searle had a very beautiful stand, which was greatly admired.

Amongst the machinery, the greatest interest centred in the Osborne Columbia Corn Harvester, an invention which appears to be destined to effect much economy in the harvesting of maize. The machine (which can be worked with two horses) cuts and binds the standing corn, and it is claimed for it that, no matter how the crop has been laid by wind and storm, this machine will harvest it. The gathering arms and chains, reaching well ahead, guide the corn upright towards the cutters; then the feeding jaws, reaching forward of the knives, grasp the stalks, forcing the cut, and, with the aid of the chain conveyers, carry the corn rearward to the binder, where the bundle is formed, tied, and discharged from the machine. The machine is capable of cutting and binding from seven to ten acres per day. It was intended to give an exhibition of its powers on a field of corn in the neighbourhood, but, unfortunately, the ground was too wet for horses to work, and we are thus unable to inform our readers as to its performances.

LOGAN FARMING AND INDUSTRIAL ASSOCIATION, BEENLEIGH.

MR. F. W. PEEK, general secretary of the above association, forwards us the following notes of the annual public meeting held in the Agricultural Hall at Beenleigh on the 28th January, when Mr. John Mahon, Instructor in Dairying, read the paper on "Farming and Dairying" which we published in full in our last number.

At the invitation of the council, through their chairman (Mr. John Stodart, M.L.A.), Mr. Mahon read a most instructive and interesting paper on "Dairying" to an audience, who, by the questions asked and answered, showed their appreciation of the matters dealt with in Mr. Mahon's address.

Mr. STODART, in introducing the lecturer, said he did so with great pleasure, and he was pleased to see the farmers of the Logan taking such a lively interest in the questions of the day as to all matters relating to agriculture, especially dairying, for which the district was pre-eminently suitable. He was pleased to see that, out of the number on the association roll, upwards of fifty members were *bonâ fide* farmers, and the balance more or less directly interested in agriculture. He was sure that associated bodies of farmers meeting together, discussing the various matters in which they were interested, such as dairy matters, pests, and noxious weeds, markets for produce, &c., and turning their attention to a subject that had been considered by them on one or two occasions—namely, co-operation—would be followed by good results. He would like to see a central butter and bacon factory established in the Logan district. He felt sure that, if the farmers would only work together, they would be enabled to achieve great things. He wished the association every success, and said that the best thanks of the meeting were due to the council and their general secretary (Mr. F. W. Peek) for such good work done, and for the credit balance in hand with which to commence another year of useful work.

Mr. J. MAHON, before commencing his address, said he was pleased to meet with those present that evening. It being his first visit to the Logan, he was not in the position to criticise or to speak upon the capabilities of the district; but in his capacity of being an expert (appointed by the Government) on dairying matters, he would be pleased to give any information or answer any questions those present might think fit. He stated the experiences of dairy farmers in the southern colonies, which he was sure could not compare with Queensland either for quantity or quality of production in proportion to the number of dairy stock or returns. He was pleased to hear, from what the chairman had said, that the Logan district was most suitable for dairying, and he would like to mention that not only butter and bacon factories ought to be established here, but likewise, he thought, a condensed milk factory should have good results, seeing the enormous amount of money sent away annually for that article alone. He stated that the old cry of "climate being too hot" was being rapidly wiped out—as he had in the North recently given a demonstration of butter-making, by chilling or cooling the cream in a simple canvas bag filled with water and standing the cream therein till of a sufficient temperature, and the results had been a splendid sample of good firm butter. He dwelt at some length on cleanliness in the dairy and the after manufacture, pointing out the impossibility of securing a first-class article if every kind of produce such as meat, onions, and general goods of that description were allowed to be placed in the dairy. He was perfectly in accord with legislation compelling the cleanliness of dairies, inspection, and grading of all kinds of dairy and other produce, as it would tend to a better class of production, and with which the Queensland farmer need not fear competition. He was pleased to meet with so many dairy farmers, and he hoped that he should be enabled to spend a little time in going about amongst them on some future occasion. In answer to a question by Mr. T. Armstrong (Loganlea) as to the best breed of cows in the stud at the Agricultural College, Gatton, and what results had been obtained, Mr. MAHON stated that, up to the present time, the dairy arrangements were not quite completed. A thorough test had not been made of the returns, but he hoped shortly to see perfect arrangements made for testing, and then the results would be published. As to the best breed, he said it was undoubtedly the Shorthorn cows crossed with Jersey or Ayrshire bulls. In reply to Mr. F. Peek (Loganholme), "Will the feed supplied to a cow—say, lucerne—communicate its flavour to the cream and

butter?" Mr. MAHON said, "Yes, if the cow were fed before milking, but if fed after milking he would say, certainly not—that is, if some time elapsed between feeding and milking." In reply to a question, "Is the article called 'preservative' any assistance in keeping butter or cream, and could the use of it be detected in the product?" Mr. MAHON said he would like to state that he did not believe in preservative or any other ingredient being added, the only thing essential being cleanliness, cool temperature, and careful manufacture to ensure good butter.

Mr. MANN said he had listened very attentively to Mr. Mahon's address, and would like to draw that gentleman's attention, and also the attention of Mr. Stodart (their member), to the fact of his having to send his cream and butter away in the same carriage with fish, oysters, &c.; and after hearing what Mr. Mahon had said about "butter taint," he could see that the complaints he had made were justified through no fault of his, but it should be remedied, as many of the farmers had complaints of the smell of their cream, which no doubt was caused during transit.

A hearty vote of thanks to Mr. Mahon for his address, and to Mr. Stodart for taking the chair, was proposed by Mr. Armstrong, seconded by Mr. Howie, and carried by acclamation; both gentlemen briefly replying.

HORTICULTURAL SOCIETY OF QUEENSLAND AND QUEENSLAND FRUITGROWERS' ASSOCIATION.

THE combined show of the two societies was held on the 1st and 2nd February, in the Centennial Hall, Brisbane. The principal exhibits were those of the Brisbane Botanic Gardens, arranged in beautiful style by the Curator, Mr. P. Mac Mahon; dahlia and other blooms by private exhibitors; and the varied assortment of grains and vegetable products shown by Messrs. Tardent and Ross, of the Westbrook and Hermitage Experiment Farms. Fruit was very poorly represented, scarcely any being the produce of Queensland. The continued wet weather prevented intending exhibitors from coming in with anything worth showing, so that, on the whole, the show was anything but the success which it has always been in previous years.

EASTERN DOWNS HORTICULTURAL AND AGRICULTURAL ASSOCIATION (WARWICK).

THE Eastern Downs Horticultural and Agricultural Association held their annual show at Warwick on the 9th and 10th February. There was a very large attendance, not only of residents in the neighbourhood, but also from different parts of the colony, and from the southern colonies. The wet weather and hailstorms which had previously prevailed, militated against any good exhibition of vegetables and other farm and garden produce, whilst the fruit fly was responsible for the absence of what is usually a feature of the south-western exhibitions, the fruit section. Mr. Ross, of the Hermitage Experiment Farm, had a unique exhibit of an immense variety of farm produce, staged to great advantage, whilst his magnificent mangolds, beets, and sugar beets proved conclusively the special adaptability of the soil for the growth of such products. The implement exhibits were very numerous and excellent. A procession of them drawn by a traction engine round the show-ring was a very happy idea, and was well carried out. We were much disappointed at the paucity of the live stock exhibits, more especially in the dairy cow section. Only two cows competed for the prizes offered for the best butter-yielding cow, and there was no competition for the bull offered by the Department of Agriculture. Full accounts of the two days' show appear in the local journals.

HUGHENDEN PASTORAL AND AGRICULTURAL ASSOCIATION.

WE learn from Mr. W. H. Mulligan, secretary to the association, that the prospects for a good season and a good show are very favourable. Since 1st January 14 inches of rain have fallen. The cattle sections omitted last year, owing to prevalence of ticks, have been reinstated, and there is every prospect of an excellent show in these sections on the 10th and 11th May next.

STANTHORPE AGRICULTURAL, PASTORAL, AND MINING SOCIETY.

THE show of the Stanthorpe Agricultural, Horticultural, and Mining Society was held on the 17th and 18th February, and was visited by a large number of persons. Stanthorpe has long been celebrated for its fruitgrowing capabilities, and, as might have been expected, the show of fruit was large, and the exhibits of apples, peaches, quinces, grapes, blackberries, almonds, olives, &c., were of splendid quality, and elicited the remark from the late Minister for Agriculture, Mr. Thynne, that he had seen no such excellent exhibit of fruit in Queensland, except that staged at the last Intercolonial Fruitgrowers' Conference in Brisbane. The fruit fly, fortunately, has not been greatly in evidence in the district. Farm produce, including cheese, butter, hams, bacon, &c., were well represented, as was also garden produce, of which there was a fine display. There were five entries for the Agricultural Department's prize for the best milking cow, but we have not had any detailed account of the competition as yet.

LIST OF AGRICULTURAL AND HORTICULTURAL SOCIETIES AND ASSOCIATIONS IN QUEENSLAND.

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Allora ...	Central Downs Agricultural and Horticultural Association	J. H. Buxton...	...
Beauresert ...	Logan and Albert Pastoral and Agricultural Society	M. Hinchcliffe	...
Beenleigh ...	Agricultural and Pastoral Society of Southern Queensland	Wilson Holliday	...
Blackall ...	Barcoo Pastoral Society ...	F. Clewett ...	...
Boonah ...	Fassifern and Dugandan Agricultural and Pastoral Association	T. de M. Murray Prior, President	...
Bowen ...	Bowen Farmers' Club ...	Thuman ...	...
Bowen ...	Pastoral, Agricultural, and Mining Society ...	J. E. Smith ...	...
Bowen ...	Preston Farmers' Association ...	R. A. Foulger	...
Bowen ...	Proserpine Farmers' and Settlers' Association		...
Brisbane ...	Horticultural Society of Queensland ..	G. K. Seabrook	...
Brisbane ...	Moreton Agricultural, Horticultural, and Industrial Association	J. Duffield	...
Brisbane ...	Queensland Acclimatisation Society ...		...
Brisbane ...	Queensland Fruit and Economic Plant Growers' Association	G. K. Seabrook	...
Brisbane ...	Queensland National Agricultural and Industrial Association	H. C. Wood ...	...
Brisbane ...	Queensland Stockbreeders' and Graziers' Association	F. A. Blackman	..
Brisbane ...	United Pastoralists' Association ...	Fredk. Ranson	...
Bundaberg ...	Bundaberg Agricultural and Pastoral Society	A. McIntosh ...	..
Bundaberg ...	Bundaberg Horticultural Association ...	H. E. Ashley...	...
Bundaberg ...	Woongarra Canegrowers' and Farmers' Association	H. Cattermull	...
Burpengary...	Burpengary Farmers' Association ...	D. J. Collins ...	...
Caboolture ...	Caboolture Farmers' Association ...	G. Mallet ...	...
Cairns ...	Barron Valley Farmers' Association ...	...	...
Cairns ...	Cairns Agricultural, Pastoral, and Mining Association	A. J. Draper ...	...
Charleville ...	Central Warrego Pastoral and Agricultural Association	A. J. Carter ...	...
Charters Towers	Towers Pastoral, Agricultural, and Mining Association	W. Tilley ...	...
Clermont ...	Peak Downs Pastoral, Horticultural, and Agricultural Society	F. Leysley ...	...
Cooktown ...	Cook District Pastoral and Agricultural Society	W. R. Humphreys ...	...
Cunnamulla	South Warrego Pastoral Association ...	J. Winward ...	...
Gayndah ...	Gayndah Agricultural and Horticultural Association	J. C. Kerr ...	...
Gin Gin ...	Pastoral and Agricultural Society of Gin Gin	E. K. Woollen	...
Gladstone ...	Gladstone Pastoral and Agricultural Association	W. J. Manning	...
Gooburrum, Bundaberg	Gooburrum Farmers' and Canegrowers' Association	W. J. Tutin ...	...
Goondiwindi	MacIntyre River Pastoral and Agricultural Society	A. Gough ...	...

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Gympie ...	Agricultural, Mining, and Pastoral Society	F. Vaughan ...	10 and 11 May
Gympie ...	Gympie Horticultural Society ...	W. G. Ambrose ...	
Helidon ...	Helidon Scrub Farmers' Association ...	J. C. Collins ...	
Herbert River	Halifax Planters' Club ...	H. G. Faithful ...	
Herbert River	Macnade Farmers' Association...	E. C. Biggs ...	
Herbert River	Ripple Creek Farmers' Association ...	J. W. Grimes ...	
Herberton ...	Mining, Pastoral, and Agricultural Association	John M. Holloway ...	
Horton ...	South Isis Planters' and Farmers' Association	H. Epps ...	
Hughenden ...	Hughenden Pastoral and Agricultural Association	W. H. Mulligan ...	
Ingham ...	Herbert River Farmers' Association ...	...	
Ingham ...	Herbert River Pastoral and Agricultural Association	Bryan Lynn ...	27, 28, and 29 July
Ipswich ...	Ipswich and West Moreton Agricultural and Horticultural Society	P. W. Cameron ...	
Ipswich ...	Queensland Pastoral and Agricultural Society	Elias Harding ...	
Kandanga (near Gympie)	Kandanga Farmers' Association ...	N. Rasmussen ...	
Kolan ...	Kolan Canegrowers' and Farmers' Association	C. Marks ...	
Laidley ...	Lockyer Agricultural and Industrial Society	John Fielding ...	
Loganholme..	Logan Farmers' and Industrial Association...	F. W. Peek ...	
Longreach ...	Marathon District Pastoral and Mining Society	...	
Lucinda Point	Victoria Farmers' Association ...	W. S. C. Warren ...	
Mackay ...	Agricultural, Pastoral, and Mining Association	F. Black ...	2, 3, and 4 Aug.
Mackay ...	Pioneer River Farmers' Association ...	E. Swayne ...	
Maryborough	Maryborough Horticultural Society ...	H. A. Jones ...	
Maryborough	Wide Bay and Burnett Pastoral and Agricultural Society	J. Willey ...	
Milbong ...	Milbong Farmers' Association ...	T. R. Garrick ...	
Mitchell ...	Mitchell and Maranoa Pastoral, Agricultural, and Vinegrowers' Association	H. J. Corbett ...	
Mosman River	Mosman River Farmers' Association ...	..	
Mount Mee...	Mount Mee Farmers' Association ...	R. Thomas ...	
Nerang ...	South Queensland and Border Pastoral and Agricultural Society	W. J. Browne ...	
North Isis ...	North Isis Canegrowers' Association ...	W. J. Young ...	
Pialba ...	Pialba Farmers' Association ...	J. B. Stephens ...	-
Rockhampton	Central Queensland Farmers' and Selectors' Association	T. Whitely, Coowonga	
Rockhampton	Central Queensland Pastoral Employers' Association	G. Mackay ...	
Rockhampton	Rockhampton Agricultural Society ...	J. C. Dove ...	
Roma ...	Western Queensland Pastoral and Agricultural Association	H. K. Alford ...	
Roma ...	Yingerlay Farmers' Association ...	F. E. Glazier... ..	
Rosewood ...	Farmers' Club ...	P. H. Adams... ..	
Springsure ...	Queensland Pastoral Society ...	G. R. Milliken ...	
Stanthorpe ...	Border Agricultural, Pastoral, and Mining Society	Geo. Simcocks ...	
Stanthorpe ...	Stanthorpe Horticultural and Viticultural Society	Jas. Scully ...	
St. George ...	Balonne Pastoral and Agricultural Association	T. M. Cummings ...	-
Toowoomba	Darling Downs Horticultural Association ...	H. Hopkins ...	
Toowoomba	Drayton and Toowoomba Agricultural and Horticultural Society	H. Symes ...	
Toowoomba	Royal Agricultural Society of Queensland ...	...	
Townsville ...	Townsville Pastoral and Agricultural Association (formerly North Queensland Pastoral and Agricultural Association)	J. N. Parkes ..	
Wallumbilla	Wallumbilla Farmers' Association ...	P. W. Howse ...	
Warwick ...	Eastern Downs Horticultural and Agricultural Association	J. Selke ...	
Wellington Point	Wellington Point Agricultural, Horticultural, and Industrial Association	G. Burnett ...	
Woombye ...	Woombye Fruitgrowers' Association ...	...	
Woowoonga	Degilbo Progress Association ...	J. Harvey ...	
Woowoonga	Woowoonga Scrub Farmers' Association ...	H. B. Griffiths ...	

SUGAR-MILLS AND MILL-OWNING COMPANIES.

Postal Address.	Name of Mill or Company.	Manager or Owner.
Ayr	Drysdale Bros., Pioneer	
Beenleigh	Albert Milling Company	
Beenleigh	Barter, Excelsior Mill	
Beenleigh	Beenleigh Central Sugar Mills	A. Kleinschmidt
Beenleigh	Hick, The Rocky Mill	
Beenleigh	Kleinschmidt, Steiglitz... ..	
Beenleigh	Ratefeldt, Junction	
Beenleigh	Stodart and Co.	
Beenleigh	Yatala Sugar Mill	Daniel and Co., agents
Bowen	Proserpine Central Mill	
Brisbane	Colonial Sugar Refining Company	
Brisbane	Queensland Sugar Company, Limited	Fred. E. Foster, secretary
Bundaberg	Australian Sugar Manufacturing Company, Annesley	
Bundaberg	Bissett and Hart, Goodwood	
Bundaberg	Bonna Sugar Company... ..	
Bundaberg	Broome and Co., Greenbank	
Bundaberg	Buchanan, Oakwood	
Bundaberg	Buss, Frederic, Pemberton Grange, Woongarra Scrub	
Bundaberg	Buss and Penny, Ashfield, Woongarra Scrub	
Bundaberg	Clark, John (juice), Ashgrove, Woongarra Scrub... ..	
Bundaberg	Colonial Sugar Refining Company, Childers	
Bundaberg	Colonial Sugar Refining Company, Millaquin	
Bundaberg	Co-operative Sugar Company (juice), Kalkie	Robt. Totten, manager
Bundaberg	Cran and Co. (Robert), Doolbi	Robert Cran, owner
Bundaberg	Cran, William J.P. (juice), Isis Scrub	William Cran, owner
Bundaberg	Dart, W. (juice), Sea View, Woongarra Scrub	William Dart, owner
Bundaberg	Farquhar, W. G. (juice), The Hummock, Woon- garra Scrub	
Bundaberg	Faulkner, Chas. (juice), Woodlands, Woongarra Scrub	
Bundaberg	Gaylard, John, Windsor, Woongarra Scrub	
Bundaberg	Gibson and Howes, Bingera	
Bundaberg	Gladroch, F. W. (juice)	
Bundaberg	Howard Bros., Howard, Isis Scrub	
Bundaberg	Invicta Sugar Mill	F. Buss, owner
Bundaberg	Johnston, Samuel, J.P.	
North Bundaberg	Jones, R., Tegege, Kolan River	
Bundaberg	King, F. W. (juice), Woongarra Scrub	
Bundaberg	McDonall, J. C., Kalbar	
Bundaberg	Noakes Bros., Spring Hill, Woongarra Scrub	
Bundaberg	Nott Bros., Windermere, Woongarra Scrub	
Bundaberg	Palmer and Son (Henry), Sharon	
Bundaberg	Penny and Co. (Thomas), Barnes School	
North Bundaberg	Penny and Co., Isis Mill, Isis Scrub	
Bundaberg	Pringle, James, Bonna	
Bundaberg	Queensland Investment Company (juice), Rubyanna	C. P. Adams, manager
Bundaberg	Rowe, J., Nindaroo	
Bundaberg	Rowe, J. A. (juice), Woongarra Scrub	
Bundaberg	Tanner, Miss C. M. (juice), The Grange	
Bundaberg	Thygeson, G., Waterloo	
Bundaberg	Turner, Ed. (juice), Longside	
Bundaberg	Walter Bros., J. Y. and T. W. (juice), Hybla	
Bundaberg	Wessel, Martin, Bellevue, Ko'an River	
Bundaberg	Young, A. H. and E., Fairymead	
Cairns	Colonial Sugar Refining Company (Hambledon)	
Cairns	Mulgrave Central Mill	
Coomera	Grimes, S., M.L.A.	
Coomera	Stephens, A. M.	
Dulong	Dulong Central Mill Company	
Geraldton	Colonial Sugar Refining Company (Goondi)	
Geraldton	Johnstone River Sugar Company	Timothy Dempsey, manager
Geraldton	Mourilyan Sugar Company	J. W. Robertson, manager
Geraldton	Payne, Innishowen	
Gin Gin	Gin Gin, Central Mill	
Gin Gin	Scott and Bray, Albion Mill	
Ingham	Colonial Sugar Refining Company (Macnade)	
Ingham	Colonial Sugar Refining Company (Victoria)	

SUGAR-MILLS AND MILL-OWNING COMPANIES—*continued.*

Postal Address.	Name of Mill or Company.	Manager or Owner.
Ingham	Wood Bros. and Boyd, Ripple Creek	
Isis	Goodhope, Larsen, and Co.	
Isis	Horton Mill, The, Horton	
Isis	Isis Central Mill... ..	
Mackay	Colonial Sugar Refining Company (Homebush) ..	
Mackay	Hynes, W. (Meadowlands)	
Mackay	Lawes, Sir J. B. (Farleigh)	
Mackay	Long, E. M. (Habana)	
Mackay	Mackenzie, J. (Seaforth)	
Mackay	McCreedy (Palmyra)	
Mackay	Melbourne and Mackay Sugar Company	J. E. Davidson, manager
Mackay	North Eton Central Sugar Mills	
Mackay	Oakenden Sugar Company, Homebush	James Smith, manager
Mackay	Paget Bros., Hill End	
Mackay	Plane Creek Central Mill Company... ..	
Mackay	Pleystowe Central Sugar Company, Limited, Walkerston	William Steedman, manager
Mackay	Racecourse Central Sugar Mill	
Marburg	Smith, Thos. L.	
Maryborough	Clark, R. F., Eaton	
Maryborough	Colonial Sugar Refining Company (Yengarie) ...	
Maryborough	Cran, R., and Co., Yarra Yarra	
Maryborough	Maryborough Sugar Company (Goodwood) ...	
Maryborough	Maryborough Sugar Factory, Limited	H. A. Jones, secretary
Mirani	North Queensland Sugar Estate Company, Limited	C. W. Toussaint, manager
Mossman River	Mossman Central Sugar Mill Company	
Mount Cotton	Heinemann	
Nambour	Moreton Central Sugar Mill Company	G. L. Bury, managing director
Nerang	Nerang River Sugar Company, Limited	
Palmwoods (N.C.	Palmwoods Central Mill (proposed)	
Line)		
Tiaro... ..	Bryrium Sugar Mills	Biddles Bros.
Tiaro... ..	Mount Bauple Central Mill	
Wolfdene	Krebs, Mathias	
Yatala	Yatala Sugar Company	George Daniel, owner
Yeppoon	Yeppoon Sugar Company	Rutherford Arm- strong, manager
	Marian Central Mill Company, Limited	W. B. Eaves, secretary

LIST OF BUTTER AND CHEESE FACTORIES IN QUEENSLAND.

Postal Address.	Name of Factory.	
Allora	Central Downs Dairy Factory	Butter
Allora	Gordon and Burns	Butter and cheese
Beachmere	Lovet and Loward	Cheese
Beaudesert	Couldery, Mrs. (Cedar Grove)	Cheese
Beaudesert	Smith, J. F. (Christmas Creek)	Cheese
Beaudesert	Stegemaan, Edwd. (Tambourine)	Butter
Beaudesert	Waldron, Joshua (Tambourine)	Butter and cheese
Beaudesert	Michael Yore (Tambourine)	Butter
Brisbane	Brisbane Butter Export Company (George street)	Butter
Brisbane	Brown, W. R. (City Ice Works, North Quay) ...	Butter
Brisbane	Cardew, F. T. L. (Happy Valley Butter Factory, Roma street)	Butter
Brisbane	Model Dairy Factory (Turbot street)	Butter
Brisbane, care of J. C. Hutton and Co., Roma street	Silverwood Butter Factory (C. M. Hitchcock, manager)	Butter
Brisbane	Springall, A. F. (Stanley street)	Butter

BUTTER AND CHEESE FACTORIES—*continued.*

Postal Address.	Name of Factory.	
Brisbane, care of J. C. Hutton and Co., Roma street	Yangan Cheese Factory (E. Bonsey, manager) ...	Cheese
Bundaberg ...	Bundaberg Co-operative Dairy Company ...	Butter
Burpengary ...	Farry, James ...	Cheese
Caboolture ...	Holbrook, S. T. (Morayfield) ...	Cheese
Caboolture ...	Lanny and Fogarty (Morayfield) ...	Cheese
Caboolture ...	Wright, John, Orange Grove ...	Butter
Caboolture ...	Zillman, John W. (Wararba) ...	Butter
Charleville ...	Wade, R. ...	Butter
Clermont ...	Keune, Christian (Douglas Creek) ...	Cheese
Clermont ...	Berry, William (Douglas Creek) ...	Cheese
Clifton ...	Pilton Dairy (Pilton) ...	Butter
Cooktown ...	McCarey, T. (Green Hill) ...	Butter
Cooktown ...	Neill, James (Trevethan's Creek) ...	Butter
Corinda ...	Brown, W. R. ...	Creamery
Eidsvold ...	McCord, W. F. ...	Butter
Esk ...	McLennan, E. R. ...	Butter
Etheridge ...	Quinn, J. P. ...	Butter
Gatton ...	Union Bank (Tenthill) ...	Butter
Georgetown... ..	Brophy, P. ...	Butter
Georgetown... ..	Manch, C. ...	Butter
Goombungee ...	McIntyre ...	Cheese
Grandchester ...	Simpson, H. Grosvenor ...	Butter
Greenmount ...	Greenmount Dairy Company ...	Cheese
Harrisville ...	Dickfus, Carl (Mount Walker) ...	Butter
Harrisville ...	Sealy, A. ...	Cheese
Harrisville ...	Sealy and Malcolm (Trelawney) ...	Cheese
Ipswich ...	Donald Bros. (Woodend) ...	Butter
Ipswich ...	North Ipswich Butter Factory ...	Butter
Irvingdale ...	McInerney Bros. ...	Butter and cheese
Jondaryan ...	Daly, Pat. (Quinalow) ...	Butter and cheese
Koojarewon ...	Koojarewon Dairy Company ...	Butter
Lowood ...	Howe and Co. ...	Butter
Mackay ...	Brightley ...	Butter and cheese
Mackay ...	Courtney, G. (Walkerston) ...	Butter
Mackay ...	Florence, J. S. ...	Butter
Mackay ...	Peterson, N. (Homebush) ...	Butter
Marburg ...	Linning, F. Wd. (Glamorgan Vale Branch) ...	Butter and a little cheese
Marburg ...	Linning, F. W. (Kirchheim) ...	Butter and a little cheese
Muttaburra... ..	Douglas, M. A. ...	Butter
Oakey ...	Cardew, E. T. (Aubigny) ...	Butter
Oxley ...	Lowood Creamery Company ...	Butter
Pittsworth ...	Macintosh, D. (Glencairn) ...	Butter and cheese
Pittsworth ...	Pittsworth Dairy Company ...	Cheese
Pittsworth ...	Yonge, W. F. D. ...	Butter
Redcliffe ...	Samson Vale Dairy ...	Butter
Rockhampton ...	Gracemere Factory ...	Cheese
Roma ...	McFarlane, R. M. ...	Cheese
Rosalie ...	Daly, John (Freemont) ...	Butter and cheese
Rosalie ...	Jones and Bebbington ...	Butter and cheese
Rosevale ...	Co-operative Creamery ...	Creamery
Rosevale ...	Sealy, A. ...	Cheese
Rosewood ...	Co-operative Dairy Company, Limited ...	Butter
Rosewood ...	Marburg Butter Factory ...	Butter
Samford ...	Wight, J. S. ...	Cheese
Tiaro... ..	Jessen, A. (Goorah) ...	Butter
Tiaro... ..	Tiaro Co-operative Dairy ...	Cheese
Yandina ...	Reid, D. ...	Cheese

The Markets.

AVERAGE PRICES FOR JANUARY.

Article.								JANUARY.		
								Top Prices.		
								£	s.	d.
Bacon	...	...	...	...	...	...	lb.	0	0	7
Bran	...	...	...	...	...	...	ton	3	19	2
Butter, First	...	...	...	...	...	...	lb.	0	0	8 ¹ / ₆
Butter, Second	...	...	...	...	...	...	„	0	0	4 ⁷ / ₈
Chaff, Mixed	...	...	...	...	...	...	ton	3	10	0
Chaff, Oaten	...	...	...	...	...	...	„	4	5	0
Chaff, Lucerne	...	...	...	...	...	...	„	3	2	6
Chaff, Wheaten	...	...	...	...	...	...	„	3	0	0
Cheese	...	...	...	...	...	...	lb.	0	0	5 ³ / ₈
Flour	...	...	...	...	...	...	ton	14	10	0
Hay, Oaten	...	...	...	...	...	...	„	3	11	3
Hay, Lucerne	...	...	...	...	...	...	„	2	1	3
Honey	...	...	...	...	...	...	lb.	0	0	1 ¹ / ₂
Japan Rice, Bond	...	...	...	...	...	...	ton	16	7	6
Maize	...	...	...	...	...	...	bus.	0	4	6 ¹ / ₄
Oats	...	...	...	...	...	...	„	0	3	8 ¹ / ₄
Pollard	...	...	...	...	...	...	ton	4	5	0
Potatoes	...	...	...	...	...	...	„	9	7	6
Potatoes, Sweet	...	...	...	...	...	...	„	3	7	6
Pumpkins	...	...	...	...	...	...	„	3	8	9
Sugar, White	...	...	...	...	...	...	„	15	15	0
Sugar, Yellow	...	...	...	...	...	...	„	13	10	0
Sugar, Ration	...	...	...	...	...	...	„	11	12	6
Wheat	...	...	...	...	...	...	bus.	0	4	0 ³ / ₄
Onions	...	...	...	...	...	...	cwt.	0	5	3 ¹ / ₂
Hams	...	...	...	...	...	...	lb.	0	0	9 ¹ / ₄
Eggs	...	...	...	...	...	...	doz.	0	0	9
Fowls	...	...	...	...	...	...	pair	0	2	9 ³ / ₄
Geese	...	...	...	...	...	...	„	0	5	0 ³ / ₄
Ducks, English	...	...	...	...	...	...	„	0	2	7 ¹ / ₂
Ducks, Muscovy	...	...	...	...	...	...	„	0	3	4 ¹ / ₂
Turkeys, Hens	...	...	...	...	...	...	„	0	5	10 ¹ / ₂
Turkeys, Gobblers	...	...	...	...	...	...	„	0	10	7 ¹ / ₂

LONDON BUTTER MARKET.

FROM W. Weddel and Co.'s Colonial Dairy Produce Report (24th December, 1897) we take the following comparative table of wholesale prices of butter and cheese for the then current week and for the corresponding week of 1896:—

BUTTER.

Kind of Butter.	1897.		1896.	
	Choicest.	Finest.	Choicest.	Finest.
Danish	110s. @ 114s.	98s. @ 106s.	116s. @ 120s.	110s. @ 116s.
Victorian	98s. „ 100s.	94s. „ 96s.	100s. „ 106s.	94s. „ 98s.
New South Wales	98s. „ 100s.	94s. „ 96s.	— „ 106s.	— „ —
South Australia	— „ —	— „ —	100s. „ 104s.	— „ —
New Zealand	98s. „ 100s.	94s. „ 96s.	100s. „ 106s.	94s. „ 98s.
Canadian	94s. „ 96s.	86s. „ 94s.	— —	— „ —

CHEESE.

Kind of Cheese.	1897.		1896.	
	Choicest.	Finest.	Choicest.	Finest.
American	44s. @ 45s.	40s. @ 42s.	51s. @ 52s.	44s. @ 48s.
Canadian	45s. „ 46s.	42s. „ 44s.	52s. „ 53s.	46s. „ 50s.
New Zealand	— „ —	— „ —	— „ —	— „ —
Australian	— „ —	— „ —	— „ —	— „ —

Farm and Garden Notes for March.

Farm.—Continue to plough up land. Sow lucerne, clover, rye-grass, oats, barley, vetches, prairie-grass, wheat, sorghum, carrots, mangolds, and Swede turnips. Plant the main crop of potatoes. Gather maize as it ripens, and watch for the ripening of tobacco. Gather the leaves as they arrive at maturity. The leaves should be wilted on the field, and subsequently dealt with according to instructions given in this and the last number of the *Journal* by Mr. Nevill.

Kitchen Garden.—Although autumn will have begun on the 20th of this month, weeds will still be troublesome. Keep them down by constant deep hoeing. Plant out cabbages, cauliflowers, Brussels sprouts, celery. Have your beds ready dug during dry weather. Let them be dug deep and be well manured, so that every available opportunity for planting out may be availed of. In transplanting, be careful to retain a ball of earth at the roots of the plants when lifting them. In planting out cabbages on a slope, make the rows across the hill. The rows should be 2 feet apart, as the vegetables thus get a free current of air which materially assists in bringing them to perfection. Asparagus beds will be the better for a dressing of salt. Make a general sowing of vegetables, broad beans, French beans, beetroot, carrot, turnip, radish, kohl rabi, cabbage, cauliflower, onions, leeks, lettuce, mustard cress, endive, peas, spinach, &c. Plant potatoes. Transplant eschalots. Beet requires a deep, rich open soil.

Flower Garden.—As the season is now getting sensibly cooler, screens and other shelter may be removed, to enable the plants to get the full benefit of the air. Autumn flowering plants will now present a very gay appearance. Look over the walks and borders, keeping them tidy and free from weeds. Dig or fork in the mulching, and keep the hoe going. Clip hedges and edgings. Continue to stake and tie plants. Store all matured bulbs in a dry place. Transplant largely for winter flowers. Continue sowing all kinds of winter flowering annuals as in February. Plant bulbs—as hyacinths, tulips, anemones, ranunculus, snowflakes, sparaxis, freesias, monthretias, ixias, ornithogalum, narcissus, iris, lidiums, campernelles, &c., &c.

Cultural Notes for Tropical Queensland.

[The Cultural Notes for Tropical Queensland, kindly supplied by Mr. E. Cowley, Kamerunga State Nursery, are given a month in advance, for the obvious reason that the *Journal* cannot reach some parts of the far North until the month of issue is well-nigh over, and hence the monthly notes would be valueless until the following year.]

MARCH.

PLANT granadillas for crop, also watermelons. Weeding should occupy considerable attention. Plant opium poppy, buffalo grass; continue planting sweet potatoes. Sow Carob beans (*Ceratonia siliqua*). Epilacna beetles will be found destroying all Solanaceous plants. Plant annatto. Hedges of *Duranta* may be planted—cuttings being used. Chicory in flower. *Bauhinia* seedlings and cuttings may be planted out. Early plantings of tobacco made. Cuttings of jute taken. Corn planted at the end of November gathered. Cow pea can still be gathered as ripe; cow pea seeds can be obtained in two months from planting. Separation of indigenous and introduced fibres continued. Cow pea planted. Planting of Kola nut cuttings can be taken in hand. Seeds of Jack planted. *Ageratum* weed will have to be contended with. Orange stocks for next year's budding and grafting may be raised; seed being procured from Southern portion of colony. Crops of broom millet reaped. First trashing of sugar-cane should now be done. Cow pea thrashed out and put into hermetically sealed tins or jars. The seeds of this legume do not long continue vital, in any case. Keep weeds down to prevent seeding. Vanilla may be planted; also tobacco. Ravages of fruit fly particularly noticeable. Vi fruit ripening (*Spondias dulcis*); this fruit makes excellent jam. Trashing of sugar-cane continued.

APRIL.

Gingeli (*Sesamum indicum*) can now be gathered for seed. Early plantings of temperate zone vegetables. Plant egg plants. Continue tobacco planting. Harvest paddy. Keep yam patches clean. Odds and ends—grass, weeds, and cornstalks, &c.—should be collected and put into silo for ensilage. Keep scarifier going whenever opportune. First planting of English potatoes may be made in the garden. Harvesting Kaffir corn. If weather is suitable, coffee-planting may be continued. Serious flood occurred in this month in 1894. Total rainfall for month, 41.195 inches.

Bananas bear all the year round, and may be planted at any time in favourable weather. The Chinese make considerable holes for the reception of the plants, but fill them up gradually.

Orchard Notes for March.

By ALBERT H. BENSON.

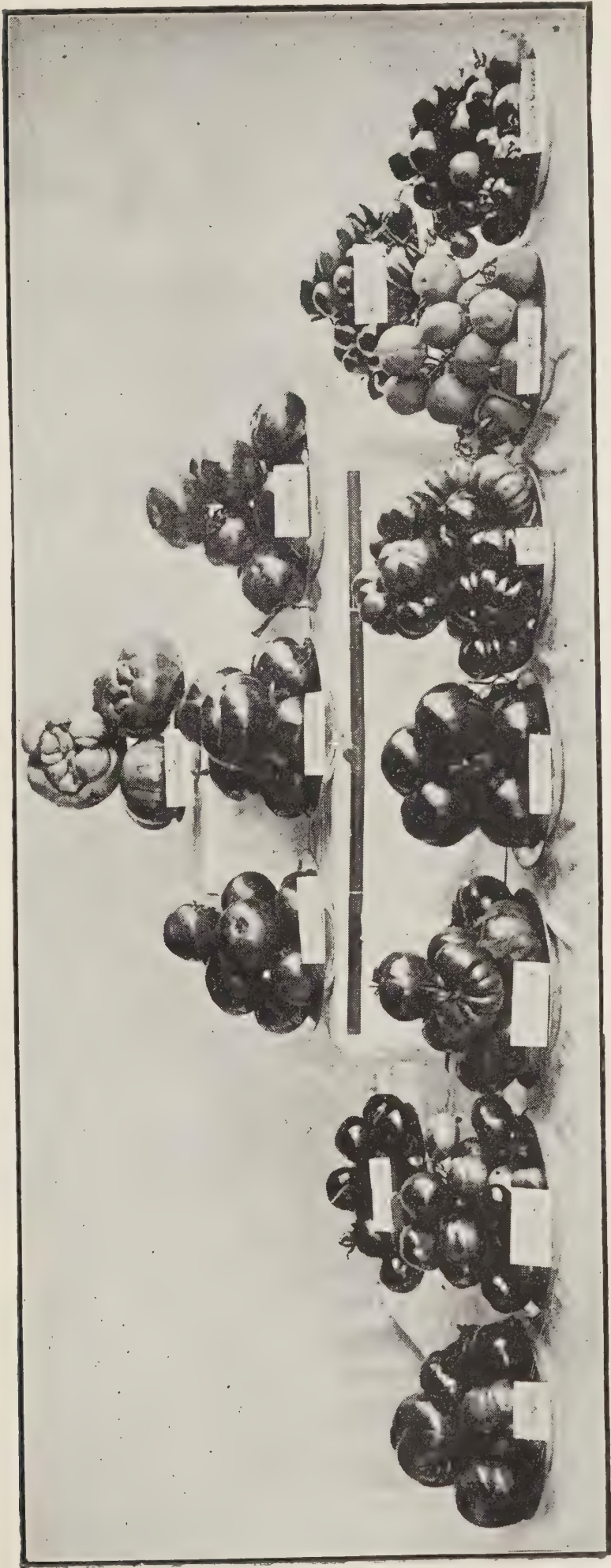
WITH the exception of a few late varieties in the Stanthorpe district, all the summer fruits are now over, and the citrus season is commencing. Early oranges will be ready to ship from the Maryborough and Northern districts during the month, for, though they will not have developed their full flavour, the Southern markets are bare of any main crop citrus fruits, and our oranges, in consequence, meet with a ready sale. Citrus fruits should always be cut, not pulled from the tree, and should be handled as gently as possible. They should be carefully graded for colour, size, and quality before packing, and should be firmly packed so that there is no danger of bruising during transit, as slackly packed fruit always bruises more or less badly. Early fruit usually carries well, as the skins are fine and tough, and not nearly as soft and brittle as they become when the fruit is fully ripe, so that with ordinary care they should reach the Southern markets without loss and in first-class condition. Main crop lemons should be getting ready to cut, as, if allowed to remain on the trees too long, they only become coarse and worthless for storing or shipping—in fact, only of value for preserving. Main crop lemons cure and keep well, the only secret in the curing being to cut the fruit at the right stage, which is usually just as it begins to get the first tinge of yellow, to handle it carefully so as to prevent bruising, and then to store in a darkened place having an even cool temperature and only moderate ventilation, but the store must not be too damp. Lemons gathered at the right time, carefully handled, and properly cured will keep for months, and will always bring more money than if they are allowed to remain on the trees till they become coarse and over-ripe. Strawberry planting can be continued during the month, advantage being taken of any dull showery days for setting out the plants. Where new orchards are to be planted the ground should now be under preparation, as if new land is to be planted it is advisable to allow it to become well exposed to the air, so as to sweeten it and render it friable for some time before the trees are planted.

Dead or superfluous trees can be removed during the month; and when replanting on the same spot is desirable, then the hole from which the dead tree has been taken should be left open, and the soil left exposed to the action of the air, so as to sweeten it before a fresh tree is planted in the same spot.

Keep the orchards well cultivated, and fight insect and fungus pests whenever and wherever found. Look out for the fruit fly, especially in guavas, as if the infected fruits are carefully gathered and destroyed it will prevent a large number of flies from hatching out and destroying mandarins, cumquats, and oranges. In the earlier part of last citrus season a large number of oranges were destroyed by the larvæ of the peach moth, the first sign that the fruit was attacked being a premature ripening, and if the fruit was carefully examined a very small hole, usually at the stem or where two fruits touched, was found; and when the fruit was dissected a small caterpillar, similar to that met with in maize and peaches, was found. The fruit when attacked fell off, and considerable loss was occasioned in several districts. The best remedy will probably be to spray the fruit, before it begins to colour, with Paris green, 1 oz. to 10 gallons of water, adding a little lime to the water to make the poison adhere better. This moth is becoming very common, and is doing a large amount of damage to all kinds of fruit, and, like the fruit fly, it would be kept considerably in check were the destruction of fallen infected fruit properly carried out, as a large proportion of the larvæ would be destroyed with the fruit.

Plate XI.

Crimson Cushion.
Dwarf Champion.
Smooth Red.
Golden Queen.
The Trophy.
King Humbert.



Ignotum. The Rival. Large Purple. Duke of York. ? New Peach. Smooth Queen.

TOMATOES.

Agriculture.

SILOS.

BY THE HON. A. J. THYNNE, M.L.C.

REFERENCE has recently been made by Mr. Tardent to the expense of erecting a wooden silo. As an exaggerated idea of the cost of a silo is very generally entertained, I venture to submit a plan which is not very expensive, and which may be built, too, by any handy man who can use the simplest tools of a carpenter. Silos can be made of any dimensions required, but for a small farmer a 50-ton or 60-ton silo would be enough to begin with.

I recently put up a silo 14 feet by 14 feet by 14 feet high, which, when properly filled, should contain from 50 tons to 60 tons of ensilage. The timber for this building cost in Brisbane only £12 10s. The roofing material—*i.e.*, the iron—was extra, and so were the tar and nails.

The timber was all hardwood with the exception of some few feet of pine used on the roof.

I give the following particulars of the design:—

The top (or wall) plates and the bottom plates (or sills), 8 inches by 2 inches, hardwood.

The 2-inch plates are used to avoid having mortices in the building. Mortices and tenons are centres for decay.

The studding should be 8 inches by 2 inches, hardwood. The studs must be stiff and strong, to resist the inside pressure of the heavy mass of green stuff.

Set a bottom plate on edge, and the corresponding top plate 13 feet 8 inches distant, also on edge, opposite it. Fit your studs, which should be 13 feet 8 inches long, and spike them through the top and bottom plates with strong spikes. The plates should be 15 feet 4 inches long, so as to overlap each other at the corners.

There are *no corner posts* in the building.

The studs nearest the corners are to be fixed exactly an inch away from the corner, so as to let every second lining-board through and be nailed to the broad side of the stud, and thus form a kind of dovetail. A stronger or simpler means of binding the walls together at the corners can scarcely be devised.

When you have fitted the studs and spiked them as directed to the plates, put the frame for each wall in place upright and fit them together, and then spike the plates together, both top and bottom.

The studs should not be more than 20 inches apart centre to centre. If a little less, all the better. On one side under the gable put one pair of studs 2 feet apart in the clear. This is for the emptying or feeding-out door.

The Sketch A attached shows the sills, position of all the corner studs, of the studs along one side, and of the feeding-out door studs *a*.

By this time the framework for the silo is complete.

What about foundation and floor? Foundation may be anything solid and level—blocks of wood, bricks, concrete, or stone that may be handy. The floor may be of earth, antbed, or, if expense is no concern, asphalt or concrete. Earth, or clay, well rammed, will do very well, especially if covered with a layer of antbed. The site should, in any case, be free from springs or wet.

The lining consists of one layer of hardwood, tongued and grooved. As this timber shrinks a good deal, it should be well seasoned. The mills cannot work it when thoroughly seasoned; they must work it rather fresh, and it will

want seasoning afterwards. The late Mr. Macansh, of Canning Downs, used to say that hardwood put in a waterhole for a fortnight to soak, and then taken out and dried, did not shrink much afterwards.

The chief thing to be secured is to have the building airtight, or as nearly so as possible.

Each lining-board should be 14 feet 7 inches. The first board should reach from the outer edge of the stud at *b* to edge of stud at *c*, the second from *d* to *e*, the third from *f* to *g*, and the fourth from *h* to *i*, thus making one complete round of the silo. They should each be so fitted as to cover the 2-inch sill as well as $1\frac{1}{2}$ inches of the studs, and be nailed to both sill and studs. Each board to be nailed firmly to all the studs inside the building that it touches, and to the broad face of the corner stud from which it starts. The second round of lining-boards begins at *m*, and goes round the opposite way. In this way every alternate board is fixed like a dovetail to the studs near the corners, and the building is made so strong there that it would take a great earthquake to burst it open.

I recommend 4-inch by 1-inch hardwood t. and g. lining-boards. They cannot shrink much.

In fixing the boards put the groove uppermost. This is not the usual way. When the first round of boards is finished, fill the groove with boiling tar. Put the next row of boards in position and force the tongue down into the tarred groove, using a clamp for the purpose. Do not drive them down with a hammer or mallet, or you will send the tar flying out in your face. When you have put in all the lining-boards, give the whole of the inside a good coating of boiled tar. The tar should be well boiled; it can be done in a kerosene tin if care be taken to prevent it from catching fire.

The coating of tar will not hurt the ensilage; on the contrary, it will check moulding, preserve the wood, check its shrinkage, and improve its quality as a non-conductor of heat or cold. Tar is cheap, and need not be sparingly used.

Put a 2-inch or 3-inch fillet in the corners well coated with the tar.

It is not necessary to enter into details of roof. Any roof that will keep out heavy rain will do; but a door must be left in the gable above the wall-plate through which to fill in the green stuff. It should be large enough to let a man get in and out beside the carrier, or there may be a door in each gable—one for the carrier, and the other for a man to go in and out by.

The feeding-out door need not be cut until the ensilage is wanted for use.

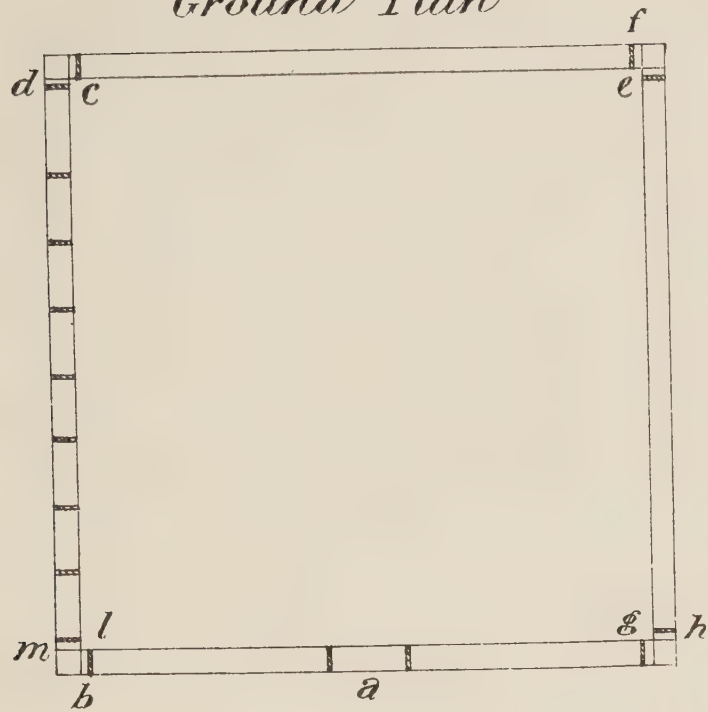
Sketch B shows end elevation with filling-in door 4 feet wide in gable, also feeding-out doorway 2 feet wide in the clear, and also the 4-inch boards dovetailing at the corners.

It is scarcely to be expected that the whole of the details can be fully explained in a paper such as this. Inquiries will be readily answered as far as possible.

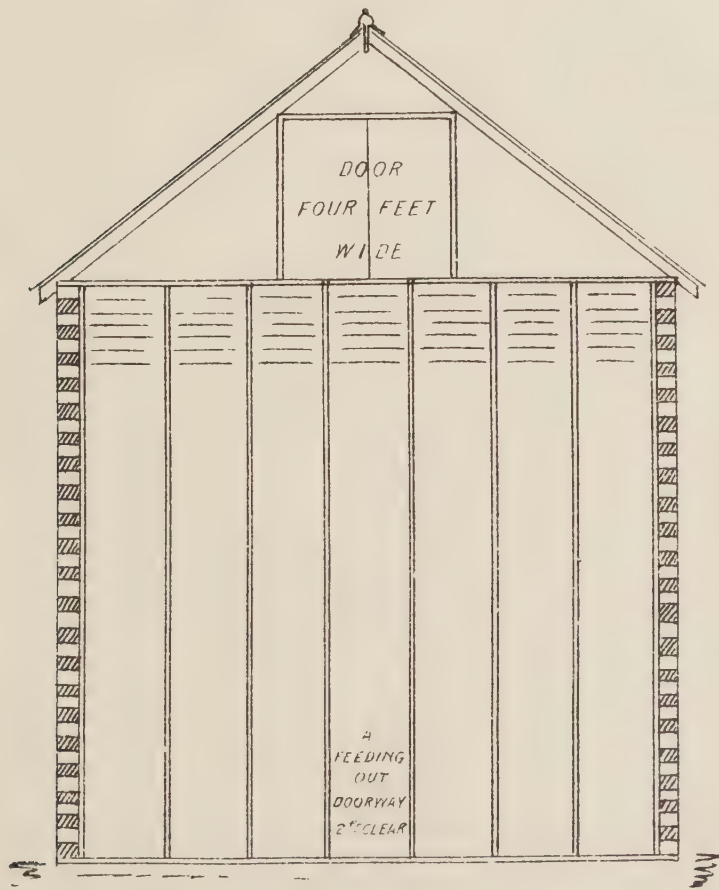
Now comes the question, how is it to be filled? In the first place any green stuff which is good for stock may be converted into ensilage. Some crops are better than others. Any of our fodder grasses may be so treated. But maize is the great ensilage crop. It should be cut when the cob is in the milky stage or when the glazing stage is reached. It is then that the greatest weight of nutritious food can be obtained. Maize for ensilage should be grown as it is for grain. What is not wanted for ensilage may be let grow on for grain. Broadcast maize does not make such good ensilage as that sown in hills or drills.

The maize or other crop should be put through a chaff or ensilage cutter, set at $\frac{3}{4}$ -inch or 1-inch cut, and taken from the cutter by one of the ordinary carriers and dropped into the silo. All the trouble and expense of the heavy weighting or pressure formerly in vogue is thereby avoided. Put in enough the first day to make a layer of 3 feet or 4 feet deep over the floor of the silo,

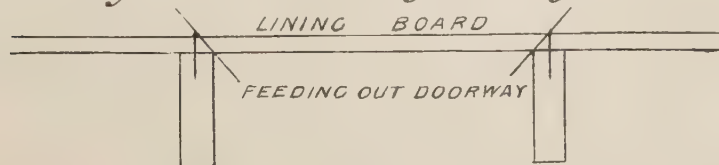
SKETCH A
Ground Plan



SKETCH B
End Elevation



SKETCH C
Shewing mode of cutting feeding out door.



but let it remain in a heap as it falls until it heats. This applies only to the first layer. It will heat better in that way and more evenly than if spread against the cold sides and corners of the building. When the first lot has heated up to 125 degrees or over, then spread it evenly over the floor, putting the hottest stuff next the walls, and especially in the corners. Pack it well in the corners and along the walls, where it should be tramped down until firm. Then put on the second layer, spreading it evenly over the surface, but having it a few inches or a foot higher against the walls than in the middle. The hot silage in the first layer will promote the heating of the second, and so on until the building is filled. The last layer should be rather heaped up in the middle, to allow for settling down there. When the last layer is heated, and by that time the mass will have settled down a good deal, put a layer, 6 inches or 8 inches deep, of damaged straw, or coarse grass, or green grass, or any rubbish of that kind, cut into chaff, and the work is done.

I have seen a No. 16 Ohio ensilage cutter at work recently here. It is quite a revelation in that class of machinery. It is capable of doing 6 tons to 8 tons of green maize per hour; in fact, two men working hard could not feed it to its full capacity from a dray alongside the feed-table. That machine can be indented from the makers—the Silver Manufacturing Company—with a 24-foot carrier (in three sections of 8 feet each) and a shredder cylinder for converting dried cornstalks (stover) into corn hay at a cost of less than £30, all freight and charges paid to Brisbane. This does not include the driving power (horse-gear or steam). The cutter can be used for cutting lucerne or oaten hay into chaff. The machine I referred to was driven by a $2\frac{1}{2}$ -horse power engine (English estimate, which is equal to a 6 or 8 horse power American estimate).

The only matter now to be referred to is the feeding out of the ensilage when required for the stock. It should be taken evenly from the top, *not from either end*. Two inches or 3 inches per day should be taken off and fed out. When opening the silo take out the decayed rubbish on the top, which will probably be found very mouldy, but yet will find consumers amongst your dry cattle (do not give mouldy stuff to your milch cows). Take out as far as a foot deep immediately behind the feeding-out doorway. Make a saw cut diagonally across the boards towards the right and left, as shown in Sketch C. Take out the boards so cut out, and, numbering them, put them so that they can be replaced next season when filling commences. They will fit back in their places, and if necessary they may get additional support by an inch strip of stuff nailed near the edge of the studs.

For a moderate-sized dairy farm, for an outlay of less than £50, a silo and cutting plant can be obtained according to the following estimate:—

60-ton silo	... ..	costing, say	£20
No. 11 Ohio ensilage cutter (capable of doing 3 to 4 tons per hour), with elevator 20 feet long	... ..	say	15
Sweep, 2-horse power, geared with power jack	... ..	say	9
Total	... ..		£44

Each farmer can calculate for himself what it costs him to cultivate 4 to 6 acres of maize. It ought not to cost him more than it did Messrs. Archer, who had everything done by hired labour, to grow, haul, and cut the green stuff into chaff.

A ton of ensilage would give a large feed to 40 or 50 full-sized cows, costing about 1d. per cow per day, and unless the cows were a poor lot (and there are too many of them on our farms) they would repay that small cost many times over.

For larger dairy farms, especially if steam-power is available, the No. 13 (capacity, 4 to 6 tons per hour) or No. 16 (capacity, 6 to 8 tons per hour) cutter is recommended.

One of the great needs of farmers, especially dairy farmers, in Queensland is the adoption of a system of providing food for their stock in times of winter and drought. Since I saw ensilage used in Canada in 1894, I have not ceased to advocate its use here, and it is with the hope that the prejudice against this "new" plan of cattle-feeding may be the more quickly overcome, and as a sort of official leave-taking of my agricultural friends on the occasion of handing over the Department to the present Minister, that I have ventured to put what I know of the subject upon paper. Ensilage, however, is not quite "new" even in Queensland, as Messrs. Archer, of Gracemere, have been making it in quantities of from 400 tons to 600 tons a year for ten years or twelve years, and this year have increased their silo capacity to about 1,000 tons. They state that the cost is only 4s. to 4s. 6d. per ton, including cultivation and all other expenses, and they were last year enabled, during a bad season, to keep their 250 milch cows in splendid condition. A fair crop of well-grown maize should give 15 tons per acre. With the general adoption of the system, how many hundreds of thousands of dairy cows could be kept in this colony of ours!

HOW TO BUILD A TUB SILO.

MR. JACKSON, the manager of the Experimental Farm at Wollongbar, has erected a small "tub silo," which it is intended to exhibit at the Lismore Show. For a "tub silo" 20 feet high, 18 feet in diameter, the following specification will answer:—Two-inch planks, 20 feet long, formed in the shape of a cistern; a temporary rim may be placed inside until the hoops are put on, after which the temporary rim is removed. Seven hoops of $\frac{3}{4}$ -inch iron; each hoop in two pieces; and each piece with a bolt and nut. Ends passed through a cast-iron block about 6 inches long, with two holes through, so as to let the ends pass each other. When all planks are in position the hoops are put on and drawn up tight by means of the nuts. The "tub" is set on a plank foundation. Three holes about 22 inches by 26 inches to admit of emptying the silo as required for feeding; fitted with bevelled planks that can be removed as required. These openings will be placed on opposite sides to each other; one on the upper portion, one at the centre, and one at the lower portion of the silo. To build: Level the ground, strike your circle of planking; lay it, and cut the ends so that they will fit. Have hoops ready, and lay on the circle to see that they are of proper size; raise one of them, say 12 feet, with stays, so that it will be in a position exactly over the other. Raise the other 2 inches or 3 inches from the foundation by means of blocks; set up the first plank, having a man on each side of it with a ladder or other means of reaching the upper hoop. Drive a 4-inch nail into the plank, so that when bent up it will catch the hoop and hold it in place. Do the same with bottom hoop. When all planks are similarly placed in position, tighten the two hoops, then the other hoops may be put on. If the timber is dry, do not strain the hoops too much, or they may burst. Any roof will do: a few poles thrown across with straw thatch; a tarpaulin; galvanised sheet iron; or bark. Fit doors in the cut holes with bevelled edges. If crop too large to fill, wait a week or so for subsidence and then go on again. Tramp well down, especially round the edges. Fill slowly, as thus a higher temperature is reached, 130 degrees to 145 degrees for good sweet ensilage; and a 100-ton silo takes six days to eight days in filling, with three wagons at work. When complete, place 1 foot of hay or cut straw (watered) on the top, and tramp well, for a cover. The silo erected at the farm is on a very reduced scale, probably carrying 5 or 6 tons of ensilage; but is sufficient to answer the purpose of illustrating how and what may be done. The specification first of all provides: Level floor, 8 feet square, of eight 12-inch by 1½-inch boards. Upon this another layer of 12-inch by 1½-inch boards is placed transversely,

and sawn to a circle of 7 feet diameter. Then the 46 necessary slabs, 6 inches by $1\frac{1}{2}$ inches, and 7 feet high, are placed round the circle and tightened up by means of hoops, in the manner previously described, but of lighter flat bar iron. In a small silo of this character it would be unnecessary to have doors, but one door has been placed in the lower position. The opening, which is 26 by 22 inches, is framed by ironwork, bolted through each slab so as to lessen the possibility of weakness upon cutting out the doorway. Short pieces of bevelled slabs are fitted into the opening; two pieces of iron in the shape of a staple are passed through the sides of metal work and slab, and bolted inside. To hold the doorway slabs in position strong pieces of wooden cross-ties, shaped to the curve of the tub, are dropped between the staples and wall of silo, jamming doorway slabs tightly in their place. When the silo is filled, and in course of time it is desired to open the doorway, it is only necessary to knock the two wooden cross-ties upwards, and the door slabs may be removed. The quantity of timber used is about 440 superficial feet. In building this small model silo it was not deemed necessary to use 2-inch planking, as is specified for a tub silo of larger dimensions. When building the tub silo in its permanent position, the lower timbers of floor, &c., should be all tar-painted as a preservative. Upon the completion of the wooden erection the interior is lined with tar-paper as a further means of excluding air and moisture, after which the silo is ready to receive the material it is intended to convert into silage. After full completion a drain should be cut all round the silo, with an outlet in the direction of the natural fall of the ground, thereby preventing water gathering and soaking into the floor and lower portion of silo.—*Northern Star* (Lismore).

ASPARAGUS CULTURE.

MR. WILLIAM EARLEY, writing to the *Agricultural Gazette* (England), says:— I have long advocated the more extended, or field, culture of asparagus, and by a simpler plan than the very general one adopted of raised beds, so generally followed in gardens. Bed culture is, of course, suitable for gardens, and has the advantage that it can be formed over all soils, whether they are suitable for this particular plant or not. A more extended method, which, for simplicity of term, is called "row culture," is efficient, and more conveniently adapted to field culture.

THE PLANT'S CAPACITIES.

To arrive at a proper comprehension of this plant's capacities, it is well to emphasise the fact that it is a British plant, and as capable of resisting cold, or severe frost, as any indigenous plant grown on this island. To fully prove its enduring qualities in this respect, I once sowed two or three seeds in a small pot, grew them therein during the succeeding summer months, and subsequently (during an excessively severe winter) laid the pot on its side upon the surface of the ground, fully exposed. The result proved that the roots had not suffered in the least. Though the plant is so very hardy in contention with frost, it cannot, however, withstand excessive moisture, or stagnant soils in winter; owing, no doubt, to the fact that the roots are so long and succulent, and the better they are grown, the more so do they become, with increased liability to injury. Probably underground peats tend to increase the evil. The very fact that the wild plant grows in the wild state amidst the sands on these coasts, as also on the sandy hillsides of Southern Russia, proves its predilection for perfectly drained ground, and the former sites prove its liking for salt, which is taken advantage of by inland growers, who habitually give annual dressings of such to their beds.

SANDY SOIL AND PERFECT DRAINAGE.

It is proved, therefore, that asparagus prefers sandy soil and perfect drainage; facts it is necessary intending growers should observe. I may add, in this connection, that it succeeds well in chalk or calcareous soils. Deep

alluvial sandy soils, devoid of water deposits below, upon impervious subsoils during the winter months, it thrives in perfectly, if they are well worked up and liberally manured; for it must not be forgotten the crop is a permanent one, which, when once properly planted, produces an improved quantity and quality perennially. Damp, very tenacious water-logged areas are, therefore, not suitable. How far the best amongst these can be improved and utilised by draining, owners will best judge. It is a subject deserving extended consideration, owing to the imperishable characteristics of the "grass" when cut and bundled, the very convenient way it is packed, and because distance from market need not in these days be a deterrent, provided growers reside within delivery distance of any of our innumerable railroads.

MARKETING ASPECTS.

As regards the marketing aspects of the subject, there can be no doubt the demand is comparatively unlimited at 1s. 6d. and less per small bundle,* a price which will well repay the grower in low-rented distant country districts, to say the least; especially when it is considered that the annual outlay necessary to keep the crop clean and manure it is so little compared with other crops cultivated. There is, moreover, great demand for large, well-grown "blades," at prices much in advance of the above. These, in fact, seem always to command very high but by no means fictitious prices, as witness the imported examples which annually arrive from around Paris, and probably from around Brussels. Such excessively fine produce results from very liberal culture; hence I do not err in saying no other crop repays thorough cultivation better than does asparagus.

The supplies of home-grown seem gradually on the increase annually, for, besides the former supplies grown around London and towards the coast in Essex, large additions in recent years come from around Worcester, &c. I cannot discard the idea that asparagus, though somewhat of a luxury amongst us, is, nevertheless, one of the most popular vegetables, seeing what a trade fishmongers have in it, beside that belonging to greengrocers. Rarely, if ever, have I seen it upon costers' barrows, however—a fact which goes to prove these sales are capable of immense expansion.

PREPARATION OF GROUND.

Given suitable ground it can be prepared so as to produce good crops, of even this vegetable, by horse labour, though manual labour, applied to trenching it, assuredly gives best results and of greater duration. All asparagus plants thrive thoroughly for at least a dozen years, and prolific beds on the old system have lasted well for twenty years and more. Even after the latter time it was not the decrepitude of the plants that was concerned, but rather their decay at the roots, caused by the soil becoming too moist, as a result of over-manuring; hence, when cultivated on suitable lands, I have no doubt robust longevity will be materially assisted.

FORMING BEDS.

The very deepest four-horse ploughing possible is necessary in connection with forming beds by horse-power. The manure should be of the best, and as liberal as possible, in view of properly burying it. Though it will be well to spread a goodly quantity over the surface of the ground before commencing operations, it will be necessary to bury the bulk by placing it in previous furrows with the fork, to be the better buried by the plough on its return bout. Asparagus likes the soil to lie closely together when it forms new roots; hence it is well to prepare the ground within the current year as soon as possible, so as to have it settled down for seed-sowing late in March,† or planting with young plants (where this plan is followed) in April.‡ Not only is it desirable to manure and plough early, but the whole preparation is best finished a month

* The price is 6d. per small bundle in Brisbane.

† September in Queensland.

‡ October.

at least before the planting; and I strongly advise that the ground be scarified as deeply as possible up or down the length of the lands, as a last operation before planting, with the object of mixing the manure up with the soil as freely and well as possible, as is always desirable in connection with all numerous and deep-rooting plants. When we part from spade culture, it is necessary also to separate from the old method of bed-making. In lieu of this, the plants should be grown in rows. The minimum distance permissible between the rows is 3 feet. As will be seen below, we advise a greater distance under certain conditions.

SOWING SEEDS OR TRANSPLANTING SEEDLINGS.

As between sowing seeds in drills, to grow and establish the future cropping roots, or transplanting seedling plants therein from seed beds sown a year or two previously, something can be said in favour of both. One or two year old plants give quickest results, and obviate a cropless season or two after the first or second year, and the expense of keeping the ground clean for that space of time between the young seedling plants whenever seed-sowing is practised. On the other hand, seeds sown in good ground, wherein the plants are to grow and establish themselves permanently, always form the most robust, endurable, and best cropping plants. Not only do the roots resent being dug up and broken, but they are rarely replaced in their new bed in the positions they previously occupied, which is more important than may be imagined. The fact is their future connection with their ground abode is an artificial one, and they lose their primitive grasp of the soil.

TIME FOR SOWING.

The proper time for sowing the seed is between the middle of February and the first week in April,* and it should be done as far as practicable in fine, dry weather. No damage from spring frosts exists in connection with early sowings, as the plants are not likely to appear until fairly warm weather occurs, and such inferior seeds existing in the samples as rot are best destroyed once for all. Whilst too thick seeding has to be avoided, owing to the afterwork of thinning it makes, it is important to sow enough to ensure an even plant when thinned out, without having resort to transplanting, as, ultimately, the seedling plants have to be thinned to 12 inches or 14 inches asunder, which is none too thick, considering the space between rows the plants have to root in. The customary depth to sow in seed beds is 1 inch, but under row culture, where there is not the same means of packing soil over the crowns, the seeds should not be sown less than 2 inches in depth, to insure that the ultimate crowns are not too shallow.

A good plan to follow wherever there are opportunities for forcing asparagus—a very simple process giving good returns—is to sow the seeds in rows 2 feet apart; let the plants all grow until they are large enough for forcing, then to dig up every other row for that purpose. This leaves the permanent plants 4 feet apart in the rows, under which conditions they ultimately succeed remarkably well.

OTHER CROPS.

It is well to remark here that by this method the whole resource of the ground is not devoted to this crop alone, as very superior crops of lettuce, dwarf beans, &c., can be grown between the rows. Indeed, the land being highly manured, no better position can be found to produce the best-hearted midsummer lettuce—however dry the season—from seeds sown in rows where they are to produce and carry the plants to perfection, without transplanting; such seeds—of the Paris White Cos section—to be sown late in the month of March†; such inter-cropping, besides assisting with market returns, tends also to keep the ground freer from weeds than it would otherwise be.

* August to October in Queensland.

† September.

When the young seedlings are an inch or two high the necessary thinning should be done, provided the seedlings are very strong; if not, the operation is best done the following season. Care must be taken not to injure those selected to remain. A very sharp-bladed knife is often a useful implement for this purpose. If the seedlings are slightly sprinkled with salt about twice a month, it will benefit them and keep off injurious pests.

AFTER CULTURE.

The whole after culture of such a plantation of asparagus consists in placing a liberal row of decayed fine manure along the rows, exactly over the crowns, during March* each year, or before the blades begin to push up. If the manure is not sufficient to produce a moiety of white base to the blades, a little soil from the sides should be drawn over it with a hand hoe.

Though the largest, highest-priced "grass" is generally sold with about half its entire length quite white, wasteful, and useless, there are not wanting signs that purchasers far prefer the more natural English grown; hence I do not advise drawing mounds of too great depth over the crowns, as a preparation for growth and cutting.

METHODS OF TRANSPLANTING.

Reverting to the plan of transplanting seedling plants, instead of seed-sowings made direct for the after crop, two distinct plans are variously advocated. One is to chop out with a spade a slanting drill, against which the plants are laid at proper distances, the roots being spread fan-shape against it and covered with soil. The other is to draw a drill row, of sufficient width for the roots on either side of the crowns; then, with the corner of the hoe, slightly draw the soil from the two outer sides of such wide drill as to cause a ridge in its centre. Upon these ridges the crowns of the plants are made, so to speak, to ride, with thin roots spread out down its sides to the lower levels on both sides. As the habit of the roots is to grow somewhat horizontally at but a few degrees angle downwards, it is obvious this latter plan gives greater facilities to the roots to assume a natural position, than when forced too directly downwards in a fan-like cluster as by the former method. As a rule, plants are purchased for transplanting. When this is done, I cannot too strongly urge on purchasers the desirability to procure fresh-dug plants, promptly dispatched and planted, as they lose much initial vigour if dug up some time previously and permitted to become dry, besides which mounded plants become very subject to extensive decay when replanted. In planting, insert the crowns 2 inches deep.

To secure the crop in the best possible condition requires almost daily supervision, because the rate of growth varies very greatly in accordance with the weather, and it is important to cut all when in a perfect state of uniform length, attention to which lessens waste and unnecessary tax upon the roots. Each blade must be cut before the scales are in anywise rough or loose about its apex. When any are cut, bundle them, and stand them upright in a dark, cool place—not in water—so that the bundles can be added to from succeeding cuttings. Do not cut the bottoms of the bundles to the necessary lengths until required for packing. Bundles of various sizes consist of hundreds, half, and quarter hundreds. Green grass is the best material for packing.

MANURING ASPARAGUS BEDS.

The *Florida Agriculturist* gives the following directions for manuring asparagus beds:—In nothing relating to asparagus has there been a greater change than in the practice of manuring. Formerly it was thought necessary to place large quantities of manure in the bottom of the deep trenches in which the young plants were set out, "in order that sufficient fertility might be

* September.

present for several trenches in which the young plants, once planted, there would be no further opportunity to apply the manure in such an advantageous place"; it was also considered necessary to use much manure every autumn to bank the beds in order that the crowns should not be injured by the winter's frost. These applications, especially that given prior to planting the young crowns, made the outlay so great, and that for so many years before any return would be received from the bed, that only small plantings were possible to those who were without considerable capital.

Although asparagus is still heavily manured, the amount now used is much less than was formerly supposed to be necessary, only about double the quantity ordinarily used upon root crops, such as potatoes, beets, &c.

It is not a good practice to put manure in the bottom of the trenches or furrows when setting out the crowns, because it is demonstrated to be rather a waste of manure than otherwise, and besides the roots of asparagus thrive better when resting upon a more compact soil; nor is it necessary that the soil should contain great amounts of humus or be in an extremely fertile condition when the plants are first put out, since by the present system of top-dressing a moderately fertile soil soon becomes exceedingly rich and equal to the demands which the plants make upon it.

Considerable improvement is produced in the mechanical condition of the soil by the use of stable manure upon beds. By the addition of humus, porous sandy soil is made somewhat more binding, and its ability to take up and retain moisture thereby increased; while, on the other hand, cold heavy soils are made warmer and more porous. Lierke, in his work on Orchard and Garden Culture, says: "On 'raw' ground it is necessary during the first years to give heavy applications of stable manure, but later, when there is an amelioration in the condition, this may be omitted." In another place he remarks: "If one has but a limited amount of manure, it is best to properly manure only a portion of the field each year, and arrange so that each portion may be so treated every two or three years."

All organic manures are suitable for use on the beds; but care must be exercised in the use of any of these lest they be too hot and injure the plants, especially if applied directly to the roots and immediately over the crowns. Where the young shoots come up through it, fresh hot manure is likely to produce rust or to render the shoots unsightly, and thus injure their sale. Especially is this true in light, sandy soils.

The practice of adding to such manurial materials of the farm as stable manure, vegetable compost, &c., single commercial manurial substances that will enrich them in the direction desirable for the particular crop to be raised does not yet receive that degree of general attention which it deserves. In the case of asparagus, an addition of potash in the form of muriate or sulphate of potash, or of phosphoric acid in the form of fine-ground South Carolina or Florida soft phosphate, &c., will in many instances not only improve their general fitness as complete manure, but quite frequently permit a material reduction in the amount of barnyard manure ordinarily considered sufficient to secure satisfactory results.

An average of several analyses of barnyard manure:—

Constituents.				Per cent.		Lb. per ton.
Moisture	...	...	...	67·00	...	1,340·0
Nitrogen	...	...	...	·52	...	10·4
Potassium oxide	...	...	...	·56	...	11·2
Phosphoric acid	...	...	...	·39	...	7·8

The average barnyard manure contains a larger percentage of nitrogen, as compared with its potash and phosphoric acid, than is generally considered economical. An addition of from 30 lb. to 40 lb. of muriate of potash and 100 lb. of fine-ground natural phosphates (soft Florida or South Carolina floats) per ton of barnyard manure would greatly increase its value as an efficient and economical fertiliser.

Judging by the amount used and by the expressed preference of growers, stable manure free from straw or other long bedding is the most desirable for use upon beds. Besides stable manure, farmyard, sheep, hogpen and hen-house manure, and nightsoil are also available when used in compost; and if the compost has been lying long enough to have caused the materials to be reduced to a uniform well-mixed mass, there is nothing better for use at the time of transplanting to cover the young plants.

In addition to these farm manures, chemical or commercial fertilisers are also available, and are used alone in connection with stable manure and in alternation with the same. Of late years these are being more and more used by growers who are without a large number of farm animals and so far removed from large cities that they find stable manure too expensive, especially as the only advantage of stable manure over these is the humus it adds to the soil and its beneficial effect upon the mechanical condition of the soil, as already explained.

TOMATOES.

MR. H. A. TARDENT, manager of the Westbrook Experiment Farm, contributed an excellent article to the *Journal* of 1st December, 1897, on the cultivation of the tomato. His experiments with this fruit have been very successful, and we reproduce in this number a plate of some of the prize varieties exhibited by Mr. Tardent at the Brisbane, Toowoomba, and Warwick shows. Writing on the subject, he says:—Mere theory is of little use if not supported by practice. As usual, with my method of growing them, the crop at the Westbrook Farm has been exceptionally heavy. The shape and appearance of the fruit were also perfect. Some specimens of the Crimson Cushion variety turned the scale at 20 oz. and measured $15\frac{1}{2}$ inches in circumference. All varieties did well, but the New Peach has been the favourite of the season, both with visitors to the farm and with the ladies of Toowoomba and Brisbane, who saw it at the shows lately held there. These shows have also confirmed my conviction that tomatoes are a most profitable crop to grow, and that there is a considerable demand for them. One Brisbane firm alone, Messrs. Verney and Sons, informed me that they were anxious to buy from 20 to 30 tons of tomatoes annually, at a price ranging between $1\frac{1}{2}$ d. and 2d. per lb. No other new facts about the growing of tomatoes have so far come to my knowledge except one, supplied by a veteran Toowoomba farmer, Mr. Glencross Smith, which I think is well worth a trial. Mr. Smith assured me that a handful of kainit spread round the plant when transplanting is sufficient to keep off the destructive cut-worm. Should experience confirm this, then one of the greatest drawbacks to tomato-growing would be overcome.

DRIED CORN FODDER V. SILAGE.

BULLETIN 122 of the New Jersey Experiment Station contains a detailed account of a carefully conducted experiment carried on to determine whether or not it is more profitable to make fodder corn into silage than to dry cure it in the field.

The corn yielded 11·25 tons of green forage, or 4·1 tons of cured forage per acre. That of which silage was made was cut into three-quarter inch lengths and put in the silo. The other was shocked in the field and hauled to the barn in October, and cut, as needed to feed, into the same lengths as the silage. It was found that it cost 6·3 per cent. more to prepare the silage for feeding than it did the field-cured fodder. This difference was mainly on account of the extra cost of hauling the green fodder. The experiment was made with milch cows. The grain ration fed with each was a good and ample one, and the same in both cases. They were fed an equal amount of dry matter with both silage and dry fodder. The silage they ate up clean, but left some of the dry fodder. It was found that the losses in dry matter were about the same in siloing as in dry curing.

The trial lasted twenty-four days; the cows were divided into two lots. One lot fed on silage twelve days and fed dry fodder the same length of time; then they were changed about, those having silage were fed dry fodder, and those first fed dry fodder were fed silage.

It was found that when fed dry fodder, the cows fell off in flow of milk much faster than when fed silage, so that the yield of milk was 12·8 per cent., and of butter fat 10·4 per cent. greater from silage, than from its equivalent in dry fodder.

This grain from feeding silage is accounted for in part, at least, by the greater digestibility of silage over dry fodder, and it was not that the silage-fed cows drew on their bodies for this extra amount of milk, for when they were weighed it was found they had changed in weight.

In summing the whole thing up, it was found that taking everything into account—the cost and proceeds—that, with milk at 1 cent a lb., or about 2 cents a quart; an acre of this corn, yielding 11·25 tons of green forage, brought 10 dollars more when siloed than a like acre dry-field cured.

A VALUABLE FODDER GRASS.

MR. H. M. WILLIAMS, of Florida, Wollongbar, New South Wales, writes as follows to Mr. John Mahon, Instructor in Dairying, Queensland Department of Agriculture:—

I forwarded you through Mr. H. V. Jackson 5 lb. of *Paspalum dilatatum* seed, which kindly accept for experimental purposes.

I send herewith full report of this grass with the other information you required. Any further information I shall be glad to give at any time.

If you should elect to purchase seed from me for the Government, I should like to know early approximate requirements, as I must arrange my seed paddocks according to demands. I may possibly have $\frac{1}{2}$ -cwt. of this season's seed left, but I cannot tell for a few days until Sydney seedsmen's orders are filled; this seed is for sowing in July. My next season's saving will commence in November, and I must hard-graze all seed paddocks required in rotation, and hold them up not later than August. My seed is supplied in same order as the orders are booked, so "first come first served."

Could you kindly send me a small parcel of blue-grass (*Andropogon sericeus*)? I have heard a good deal of it, and that it is a highly prized Queensland grass. I should much like to experiment with it in pastures here. If you can send me some seed, kindly say when it should be sown, and any other information about it you may think useful.

PASPALUM DILATATUM.

This grass was introduced into the Richmond River district about five years ago; and after noting its texture and watching its rapid growth, and the avidity with which stock seemed to eat it, I determined to give it a fair trial as a permanent pasture grass, and it has more than answered my expectations. It has now been growing on my farm for nearly four years, and the results prove it to be the very best grass in the district; it gives me more feed all the year round than five times the acreage planted with any of the other grasses. Of course I mix other grasses with it, such as cocksfoot, rye, clover, some of the poas, rib-grass, and others as a change for the stock, but the pasture may fairly be said to be solid with *Paspalum*. It naturally attains a height of 2 feet 6 inches to 3 feet when in seed, and it bears a large quantity of seed-heads; These, however, do not ripen all at once, nor do the seeds on the same head, but as the heads ripen the matured seeds drop out, and so go on dropping until all the good seeds have fallen out. This peculiarity makes it tedious and laborious to save a first-class marketable quality. If the seed is gathered when the heads begin to shed (which is the right time), the stems should be taken into a barn and shaken, not thrashed, for the first two or three days; all the matured seeds will shake out with the first three shakes; and although, if shaken again for several days, a great deal of seed will be obtained, it will contain so many unripe seeds that it is not fairly a marketable quality, and would not give satisfaction to a purchaser. It should all be saved, however, for home use, because a percentage of it will germinate. If the crop is allowed to go a little over-ripe before saving is commenced, a first-quality seed may still be obtained, but the sample will show rather too many of the dried immature seeds of a straw colour. The quality of the seed should be judged by its relative weight. Great care, labour, and judgment are required in saving a first-class marketable quality, and I do not think the price can go much below its present value for a first-quality seed.

Wholesale, I am supplying the Sydney seedsmen at 4s. per lb., but smaller quantities are charged for at 5s., all freight to be added. It stands grazing well, and goes on for years producing a vast quantity of feed. At present it is with me carrying one beast to the acre; and as the sole thickens next year and all the bare places get filled (where I am continually burning off logs), it will carry more stock. All stock eat it greedily; horses keep fat, and milking cows in good condition. The quality is undoubted, and I annex the result of my tests at the separating factory for 1897. It makes a first-class hay and chaff, and at present I am called upon for more than I can supply. This is the first season I have tried the hay and chaff, and I was not prepared for a regular demand. This will be remedied next season. If sown under favourable conditions, it will germinate in eighteen to twenty-one days, and as soon as it has formed its second leaves will grow rapidly. It requires, therefore, rather a long continuance of moisture to start it; heat also is required, and it is therefore no good to sow at same time as our ordinary grass seeds. The proper times to sow are previous to the spring and midsummer rains. In this district I sow from 1st December to 10th February, and from 1st July to 10th September.

The Queensland seasons may differ somewhat, but allowance can be made. When once established, it stands any amount of rough usage; the droughts do not hurt it, and it stands the frost well, although the cold winter weather checks its growth. Fire even does not kill the roots; at the same time it can easily be got rid of by ploughing and harrowing, as it does not grow from pieces like couch, &c.

I annex copy of analysis, and also the report of Mr. McKeown whilst manager of the experimental farm here. The analysis is published in our *Government Gazette*, May, 1896; report, *Government Gazette*, August, 1896.

NOTE.—The seed will not germinate between flannel; at least as far as my experience goes.

ANALYSIS OF HAY OF "PASPALUM DILATATUM."

By F. B. GUTHRIE, New South Wales.

The hay, of which the following is a complete analysis, was supplied from the Wollongbar Experimental Farm, Richmond River:—

Moisture	...	...	...	...	10.55	
Total albuminoids	...	...	...	...	10.31	
Soluble abuminoids	...	...	...	...	...	1.38
Insoluble albuminoids	...	...	...	...	...	8.93
Digestible fibre	...	...	...	...	29.96	
Woody fibre	...	...	...	...	27.95	
Total ash	...	...	...	...	6.37	
Soluble ash	...	...	...	...	...	4.32
Insoluble ash (by difference)	...	...	...	...	...	2.05
Amide compounds, chlorophyl, &c.	...	...	...	...	14.83	
Total nitrogen	...	...	...	...	...	2.66
Nitrogen in amide compounds, &c.	...	...	...	...	...	1.01
						100.00

[The above, with other information, is published in the New South Wales *Agricultural Gazette*, May, 1896, fo. 328.]

REPORT BY G. M. McKEOWN,

Manager, Experimental Farm, Richmond River.

Paspalum dilatatum.

Probably the best fodder or pasture grass yet introduced to this district, resisting both heat and cold, and yielding enormous quantities of fodder; much liked by stock, and shown by analysis to be of excellent quality. Plants, in drills 18 inches by 6 inches apart, quickly reached 5 feet in height; a test cutting showing a yield of 13 tons 7 cwt. per acre. From a seed plot sown on 28th September, in subsoiled land, a second cutting was obtained on 3rd June in the following year, weighing at the rate of 19 tons 4 cwt. per acre; subsequent cuttings, after collecting the seed, yielding over 14 tons per acre. In deeply worked land at least three crops may be obtained annually. In all seasons good pasture may be obtained from this grass if not overstocked, and once established it stands well the grazing and trampling of stock.

[The above is published in the New South Wales *Agricultural Gazette*, August, 1896, fo. 530.]

"Paspalum dilatatum" Grass.

FACTORY TESTS.

H. M. Williams' Cows, Florida, Wollongbar, New South Wales.

Cows being fed principally on the above grass.

	1896.	1897.		1896.	1897.
January	...	3.7	July	4.2	4.1
February	...	3.7	August	4.1	4.0
March	...	3.8	September	3.9	3.7
April	4.00	3.8	October	3.8	3.6
May	4.00	4.1	November	3.9	3.5
June	3.80	4.3	December	3.8	3.6

This grass is now being grown at the Queensland Agricultural College, and at the State Farms at Westbrook and The Hermitage, whence seeds and plants will be supplied on application being made to the Department of Agriculture.

Dairying.

ON DEHORNING CATTLE.

By P. R. GORDON.

It is now too late in the day to write in defence of the practice of dehorning cattle. In their wild state, when health and vigour were solely dependent on the survival of the fittest, horns were, no doubt, indispensable; but in domesticity, physiologists have failed to advance an argument in favour of the retention of the horns. In these days, when the trucking of cattle to market has become general, it goes without saying that much injury is done by horns, and the same applies, although in a less degree, to stockyards. But it is not only in trucking and yarding that the benefits of dehorning are apparent. The loss of the horns has been found to have a potent influence in the quietening of wild cattle. It is well known to practical cattle-men that in many herds there are a certain number of wild untractable cattle, which select, as their pasture grounds, mountainous or scrubby country, and become leaders of mobs which give much trouble to stockriders at mustering time. A well-known and generally adopted method of quietening such cattle is to saw a portion or the whole of their horns off, which has the effect of completely altering their disposition from aggressiveness to that of timidity, with the result that they leave their "flash mobs" and attach themselves to quieter companions. In this way, they fatten much more quickly and kindly than when in their wild state.

The question has been frequently mooted whether the practice of dehorning, if generally adopted, would ultimately result in a hornless breed of cattle. Judging from the many known instances of the power of heredity in perpetuating mutilations, and on the hypothesis so clearly laid down by Darwin, there seem to be strong reasons for adopting the belief that a polled breed of cattle would ultimately result from the practice; but to attain that end, it would be necessary that all bulls, as well as cows, in use in the herds should be dehorned.

Some two years ago I made arrangements, through the late firm of Messrs. Foster and Kelk, for the importation of a few of the latest improved dehorning implements from America. These were readily bought up here, but, unfortunately, I have not had reports of results of their use, and do not know if they have been extensively used. When the dehorning machine is used, it should only be so on full-grown cattle, as immature horns when lopped off are apt to grow again. In dehorning adult cattle, the horn should be cut off close to the skin of the head. But the most satisfactory and least painful process of dehorning is by the use of caustic soda on very young calves, the younger the better. Mr. J. L. Thompson, the late principal of the Hawkesbury Agricultural College, practised this mode of destroying the growth of horns, and reported it as most successful. If the young horn has not made its appearance above the skin, it should be felt for by the fingers. The surrounding surface should be saturated with a little oil or grease to prevent injury from the caustic soda. With a small portion of a sponge or a piece of rag firmly tied on the end of a small stick, the "button" should be rubbed with the caustic soda, which will effectually stop further growth, and the animal grows up a poley, a curled lock of hair taking the place of the horn. Complaints have been made as to the failure of this process where tried in this colony, but the failure must have been due to the caustic soda having been exposed to the air.

It should be borne in mind that when caustic potash is exposed to the atmosphere, it loses its power as an escharotic, and, therefore, the air must be carefully excluded from it.

Although I have never heard the argument advanced, dehorning may have been objected to, as it would interfere with an article of export of considerable value to butchers, meat companies, and boiling establishments; but it can be very easily shown that the advantages of dehorning are much greater than the loss of the by-product of horns. The evidence of the Americans, who make the most of all by-products, and where dehorning is more extensively practised than in any other country, may well be accepted on that point.

HINTS AS TO NEW BREEDS OF CATTLE.

THE following paper, by Mr. Robert Bruce (secretary of the Dublin Society), which we take from the *Live Stock Journal*, on the subject of new breeds of cattle, will be read with interest, especially as Mr. Bruce is considered the best judge of cattle in the United Kingdom, where he has won many a championship himself:—

While much attention has been given to cattle-breeding during the present century, it is somewhat peculiar that near the dawn of the 20th century we possess no greater number of distinct breeds of cattle than did the cattle-breeders of Britain 100 years ago. That many, or at least several, of our now distinct breeds were produced during the close of the 18th and the beginning of the 19th century cannot be denied, and it would seem as if for the past hundred years cattle-breeders have accepted the legacy left them in the matter of breeds, showing little, if any, inclination to increase their numbers. Many will no doubt hold that during the past hundred years several of our now popular breeds have been so improved as practically to have become new varieties. While such opinions may be, and are held, it would, by owners of these breeds, be considered heresy to question their antiquity, or their claim to having been a distinct breed in the latter part of the last or the beginning of the present century. Let us take any breed, any of our now established breeds, examine the pedigrees as recorded in the herd-book, and less even than 100 years of backward tracing will lead us into a maze from which it is most difficult to escape with authentic genealogical records likely to satisfy a careful student. If this be the case, and we venture to assert that it is, it is impossible to get beyond the fact that in the improvement of all our breeds of cattle there must have been much mixing up at no very distant date. Breeders of the 18th century, having been taught by Bakewell, resorted to close breeding, or in-and-in-breeding, with the view of fixing types and establishing prepotency, so that distinctive qualifications could be safely counted upon, like begetting like, and breeds becoming established.

It seems strange that cattle-breeders during the present century should have rested satisfied with the breeds of cattle they possess without attempting further departures, when sheep-breeders, pig-breeders, fanciers of dogs, poultry, rabbits, &c., as well as gardeners, have continued to bring out and fix new types, new breeds, and new varieties.

If we take the most widely spread of all our breeds and consider for a moment what has been done by Shorthorn breeders since the day of the Collings, we will find that, speaking generally, they have striven to produce, and aimed at breeding, nothing more than did those famous breeders of 100 years ago.

In the face of keen competition, through improved means of transit and other developments, the rough and ready farming and stock-breeding of bygone days must necessarily be changed if farmers are to derive profit or even a living. Britain is famous for being the home of breeds of cattle, horses,

sheep, and pigs unequalled in any other country throughout the world, and yet we see on our pastures, and in our fairs and markets, a large percentage of all kinds of stock of a very inferior class—a class little, if any, better than the semi-wild Western Rangers landed in Birkenhead and Deptford.

Is this inferiority of our cattle solely due to carelessness of our ordinary farmers, or can we look for some other cause for what is without doubt an enormous national loss? We believe we can. The majority of our cattle are bred by occupiers of small holdings, and it is only in certain districts of the country, let the cause be what it may, where the food, the shelter, or the attention is such as to suit the proper development of the stock produced by well-bred specimens of our established breeds of cattle. No doubt it may be said this difficulty may be easily met by improving the farming, the buildings, the shelter, and the education of the people, so as to ensure careful attention to the proper and profitable management of stock. While this is true, it must be confessed that, if the improved quality of our live stock has to depend upon such radical changes, we must for many years to come see the average quality of our "cattle population" much below the wished-for standard.

If, therefore, knowing that cattle (let them be of whatever or whichever of our present day improved breeds we may care to name) must be called upon to live and reproduce their kind under circumstances unsuited for their proper development, it is a mistake to despair of being able to attempt to meet the difficulty. We possess the necessary elements, and there can be no reason why we should not produce new breeds of cattle, more suited for the rough and ready life they unfortunately have to lead, than those of the present day improved breeds. To many this may seem a startling proposition, as any advice advocating an attempt to improve cattle by using what they would term cross-bred bulls, would be looked upon as a heresy. When, however, we consider that the foundations of all our improved breeds were laid by cross-breeding, to be followed by selection, we affirm that what has been done can be done again.

We are to-day in a different and better position than were the breeders of the last century. Stock can be transported from one district or country to another, while many other facilities are within our reach altogether unknown to our forefathers.

It is now necessary for the furtherance of the object in view to see if, amongst our present day breeds, we do possess the elements for the production, within a limited time, of a class of cattle better suited to meet the requirements of our ordinary farmers, the class as we have seen in whose hands the larger number of our cattle are bred.

It is no longer necessary, nor in many cases even profitable, to breed, rear, and feed large-sized cattle. The beef consumers do not now purchase large joints; they want small joints, with a greater proportion of flesh. This being so, it is towards the smaller breeds of cattle that we must turn our attention if we aim at producing marketable high-priced beef. So far from this being in any way a stumbling-block in the way of profit to the small holdings cattle-breeders, it must be all in their favour. If they cannot realise so much individually for their cattle, they can, on their acreage, grow and maintain a larger number than if they possessed animals of larger size. Not the least of the many advantages of small cattle is the fact that many retentive soils, badly drained soils, or soils having a thin covering of herbage, suffer less from their tread than if stocked with animals of a heavy breed. This alone is all the more important in districts where the cattle graze out the greater portion of the year.

As has been indicated, the intention of this paper is to advocate the production of new breeds suited to the life and circumstances they individually have to face, and in the mixing of the blood of the larger with that of the less improved smaller breeds, to attempt to evolve types likely to exist and thrive on a less liberal fare and less expensive management than what must be accorded to our present day improved breeds of stock.

To put sires of our acknowledged breeds to small cattle indiscriminately picked up, and to depend upon stock bred from such parents as foundation animals for our proposed new breeds, would be a system no practical breeder could recommend. Unless we can put our hand upon a small breed of cattle whose bulls and cows have an amount of inherent prepotency, we can only expect to breed cross-bred mongrels. Happily, however, we have a small breed of cattle peculiarly adapted for our purpose, and it is somewhat interesting that their prepotency, which adapts them for such a purpose as we have in view, has, in our opinion, been the outcome of neglect. We refer to the Dexter breed of cattle, and, as this breed may not be known to readers, it may be well to give a few particulars regarding it.

Kerry, the home of the Kerry breed of cattle, is situated on the southwestern coast of Ireland, and is to a large extent mountainous, and, agriculturally speaking, extremely poor. In a wide extent of the country the surface is almost one continued expanse of rock. The farms or holdings are small, and it is no uncommon sight to see fields, one, two, three, and more acres, marked off by stone walls, where even under spade cultivation not 1 per cent. of their extent is available for cropping. As can be easily understood, there are better and worse tracts of country, and in the better portions we find the Kerry cattle, a breed possessed of many valuable qualifications as dairy stock. Along with the Kerry cattle, and, speaking broadly, in the higher and poorer portions of the country, are to be found the Dexters.

It has been put on record that the Dexters owe their name to having been brought before the public by a Mr. Dexter, agent to Maude Lord Hawarden. "This gentleman is said to have produced this curious breed from the best of the mountain cattle of the district. He communicated to it a remarkable roundness of form and shortness of legs. The steps, however, by which this improvement was effected have not been sufficiently recorded; and some doubts may exist whether the original was from a pure Kerry or some other breed proper to the central parts of Ireland now unknown, or whether some foreign blood, as the Dutch, was not mixed with the native race."

Such are the particulars given in the first volume of the Kerry and Dexter herd-book regarding the Dexter breed of animals.

Judging from what one sees at the present day, it would seem as if the late Mr. Dexter could have had no lack of material when he set about building up his herd. Through carelessness on the part of the stockowners in the poorer districts of Kerry, their cattle had become intensely in-bred, and, through the law of "the survival of the fittest," a short-legged, wide-chested breed of animals had been evolved, admirably fitted to gather a sustenance on the high, steep, poor—almost barren—mountain sides. No doubt Mr. Dexter selected his herd with great care, and bred with much judgment; but everything points to the fact that Dexter cattle are nothing more than intensely in-bred Kerries, let them be crossed and recrossed by whatever breed they may, even by a breed that may have been registered for a long series of years, and experience has proved the extraordinary prepotency of the Dexters. Instances might be quoted of first crosses from the Dexter and Shorthorn, Dexter and Hereford, Dexter and Aberdeen Angus, when but for a change of colour or the absence of horns it would have been impossible to detect there had been any mixture with the Dexter blood. We have unquestionable evidence of the prepotent power of this breed in the beautiful herd of Dexter Shorthorns owned by Major Barton, Straffan House, county Kildare. At Straffan can be seen a number of animals bred from a foundation Dexter cow, and the result of four, five, and six consecutive crosses of pure Shorthorn bulls, yet possessing the Dexter type in a marked degree. What, however, is more extraordinary, bulls owning five direct and consecutive Shorthorn crosses upon the original Dexter foundation (which mathematically means an almost entire obliteration of the Dexter) are practically Dexter themselves, and when put to pure-bred Shorthorn heifers leave stock of the Dexter type.

One can scarcely imagine a more decided instance of *multum in parvo* so far as a milk and beef producer is concerned than any one of Major Barton's cattle, while the crosses from Herefords and Aberdeen-Angus bulls and Dexter cows, which may be seen in many parts of Ireland, are perfect specimens of butchers' animals.

It may be stated that the Dexters are, for their size, deep-milking cattle. A pure-bred Dexter belonging to Mr. Norman Cookson, Oakwood, Wylam-on-Tyne, in the summer of 1896 gave milk equal to her own live weight under seventeen days, while instances might be quoted of Major Barton's small Shorthorn Dexter cows, when in full milk, giving 18 to 22 quarts per day.

Much could be said on the subject of new breeds, but the purpose of this paper will be answered should it direct attention to a matter deserving more consideration than is at present given to it. However well adapted our improved breeds of cattle may be for consuming with profit the product of rich, well-farmed lands in the hands of the larger landholders, we must never lose sight of the fact that "the multitude of cattle are in the hands of small men" bred and reared upon indifferent land and under indifferent management.

DAIRY FARMING IN DENMARK.

THERE are some five hundred Co-operative Cattle Breeding Societies in Denmark, each society owning one bull. There are eighteen local Agricultural Societies in the country, and each of these societies has in its service a Consultant—*i.e.*, an expert—who is partly paid by the Government and partly by the societies. These experts go about to advise the Cattle Breeding Societies as to the selection of the bulls to be purchased, and they also examine the milk records of the different cows in the different herds represented in each society, and select the best cows as being the ones to be served by the society's bull. In addition to these Consultants, the Government has its own Consultants, who are called Statsconsulenter, and three of these Statsconsulenter are specially deputed to advise the societies in regard to stock-breeding. Mr. Morkeberg has to advise in regard to the breeding of the red Danish cattle and pigs; Mr. Apple has to advise in regard to the breeding of Jutland cattle and sheep; while Mr. Jensen has to advise in regard to horse-breeding. Farming in Denmark—which practically means dairy farming—is all pivoted on the co-operative principle, and the Danish Government lends very effective assistance to the dairy farmers by placing so many experts at the service of the agriculturists.—*Northern Star* (Lismore).

SPRING HILL DAIRY COMPANY, LIMITED.

DURING the half-year ended 31st December, 1897, 3,204,996 lb. of milk were treated at this factory for 127,460 lb. butter; average test, 3·61; pounds milk to 1 lb. butter, 25·14. Price received for butter per lb., 9·62d.; price paid for butter fat, 9·83d. per lb., or 3·53d. per gallon.

The balance-sheet for the half-year ended 31st December, 1897, is as follows:—

CR.						
By Proceeds of cream	...	...	...	...	...	£5,184 16 9
Allowance on separators	...	...	...	...	...	65 0 0
Refund, Income Tax	...	...	...	...	...	1 10 0
						£5,251 6 9

Dr.							
To Balance last audit	...	...	...	...	...	...	£38 7 1
Paid milk-suppliers	...	...	...	...	...	...	4,714 18 0
Wages ...	...	...	...	...	...	...	146 17 0
Carriage of cream, &c.	...	...	...	...	...	...	69 17 11
Fuel ...	...	...	...	...	...	...	22 6 6
Interest on—							
Shares	...	...	...	...	...	£30 12 8	
Account	...	...	...	...	...	0 2 3	
							30 14 11
Separators—							
Allowance	...	...	...	...	...	£65 0 0	
Cheque	...	...	...	...	...	32 16 3	
							97 16 3
Milk pump, &c.	...	...	...	...	...	...	15 3 2
Repairs to road, &c.	...	...	...	...	...	...	54 17 9
Balance...	...	...	...	...	...	...	60 8 2
							£5,251 6 9

Audited and found correct.

W. H. ELVERY, Auditor.

—*Northern Star.*

Horse-breeding.

CROSS-BREEDING.

BY "ARAB."

THE prices realised in London for the horses of the New South Wales troops is ample evidence that even our well-bred horses are wanting in marketable value—public spirit and patriotism had placed the best at the service of Colonel Lasseter's corps—and the result in the London market was a paltry £120 as the highest price. Had any horse-breeding county of England or Ireland been searched with the same patriotic zeal to send out its best stamps, what a difference their London market value would have represented. Horses of high class of all breeds—Arabs, English-racer, Clydesdale, and Shire—have been imported to Australia in numbers sufficient had they been skilfully handled, and their good points conserved, as would have made the horse stock of Australia second to none in the world.

That they have been most unskilfully handled by the colonists, the state of our stock emphatically proclaims.

In blood stock, owners of such horses as Sir Modrid, Darebin, and others of like calibre—having stoutness and staying powers—are not patronised as they deserve. Darebin might have been a sire of plough horses. Of course, in the eyes of modern turfites, this may appear no compliment to Darebin; still I believe it to be the highest merit that can be credited to a thoroughbred horse.

Of high-class Clydesdales, enough have been imported to Australia to have made the draught horse of Australia amongst the best in the world; instead of which, though he has been increased in size and numbers, he is not as good as he was a quarter of a century ago; and if we take the draught horses to be seen in the streets of Brisbane to-day as a fair sample of the draught horses of the colony, even a small draft of horses fit for home markets would be hard to get together.

The large importation of high-class Clydesdales is certainly not responsible for this, nor need we blame the importation of large numbers of Shires; either of those breeds or types skilfully and carefully handled and bred within themselves would have given a stock of horses fit for export. The trouble has arisen through injudicious indiscriminate crossing of those two breeds, or rather formations—the Clydesdale, being of oblique formation, fails to nick well with the straight formation of the Shire.

The large expenditure for high-class sires has practically been thrown away owing to the unscientific unskilful way in which they have been crossed. The good points of both have been lost, and bad points belonging to neither have been developed.

In our show rings I have seen a draught horse carrying the blue ribbon for best horse and also a special prize for good action, which from cross-breeding had the forequarters straight and deficient, whilst his hindquarters were of the oblique formation. He could neither walk nor trot level, but had an ambling shuffling gait, and yet the judges could not see it, and, as colonial judgment goes, they were good judges, too.

The horse judgment displayed in our show-rings where draught is concerned is a thing to make gods and Scotchmen weep. I remember being present at a country show over twenty years ago. One of the horse judges was a man long and favourably known in Brisbane as an owner and breeder of racing

stock. The other was locally reputed to be a judge, and a good judge, too. Two horses were in contest for honours—one was a Clydesdale sort, the other a Shire. Neither was of high class. The award was given the Shire. The Clydesdale, by far the better animal, was bog-sprained. This would have justified the award; but I had good reason to suspect they were both innocent of having any knowledge of it. Having no interest in the award, and the racing man being an old acquaintance, I asked him what had influenced them in their award, as, in my opinion, the discarded one was much the best horse. I was surprised when he replied they could not think of giving the blue ribbon to a horse with white face and legs, and yet they had just awarded the blue ribbon in the blood section to a horse of this description (Drum Major).

I could not help pointing out the inconsistency of his judgment—that on the turf they could not afford to veto white faces and feet, neither could the Clydesdale breeders; that the best families threw those markings; and that in the best family of Arabs similar markings were a feature. In fact, the white markings of the English racer and the Clydesdale are evidently derived from the same Arab source.

Some years ago, in the early eighties, a Darling Downs squatter imported a lot of high-class Clydesdales from Scotland—several mares and a horse. They were an invaluable lot to any community who could appreciate them. They were not appreciated, and, strange to say, the most valuable—those of highest merit—were least appreciated by our show-ring judges. One mare of most extraordinary merit was never looked at, whilst one which ought never to have appeared in the same company got the blue ribbon. They belonged to the same owner; still the harm of such absurd judgment was just the same.

This absurd judgment unfortunately is not confined to the show-ring; it is to be found amongst the owners and managers of the largest studs. The manager of a large stud was showing me through his horses. They had been most successful in getting together such horses as Musket, Nordenfeldt, and other turf celebrities; they had also got together a grand lot of Clydesdales, and were successful in rearing some grand colts by Blair Athol (C.S.B.); but at the time of my visit this grand horse had fallen into second place. The reigning glory of the stud was shown me—he was a Shire horse with a long Clydesdale pedigree, and manager and directors had a long elaborated list of his measurements to show how much he excelled Blair Athol.

I had to say that, in spite of his pedigree, he was a true Shire, and gave my reasons for saying so, which were convincing enough to be unanswerable. The manager informed me that he had intended going in for Shire blood; in that case he could have easily purchased four Shires equally as good for the same money as he had paid for this Clydesdale pedigreed one. Here was success achieved by a fluke, and great expenditure of money on the point of being reversed through want of practical knowledge on the part of the management. So long as they kept in the old groove, and bred pure, their amateurish zeal and wealth combined enabled them to buy the best, and, like breeding like, success was assured; but the lack of practical knowledge was such that the success attending the first venture, when pure Clydesdales of a high class were being mated, was being ruined through a Shire horse with Clydesdale pedigree being used. This occurred in New Zealand, North Island—not in the South Island, where the Scotch farmers would have helped the manager to a better knowledge of what he was working with. But the same thing is working and ruining the horse stock throughout Australia.

Had the Clydesdale with his oblique formation been the only draught horse introduced to raise the weight of our stock, no harm would have accrued through his use.

With extraordinary skill and careful selection, a good stock of horses might have been built up even from the Shire horse. A gelding I owned twenty years ago of the best Clydesdale type had little or no Clydesdale blood in him—his sire was by an imported Shire out of a mare whose dam or granddam was a half-bred Arab. The Arab strain imparted by the sire gave

this horse every characteristic of a true Clydesdale. When he died—though willing to give £80 in Brisbane for a horse to take his place—I could not get one, and had to put two horses at his work. But the skill and judgment required to raise good styles of horses on those lines is scarce, and even in skilful hands the misfits must always be much more numerous than the fits.

The only reasonable and safe plan to improve our horse stock is to breed on the lines of “like breeds like.”

Another gelding in the stable—sired by the imported Shire, grandsire of the other gelding—was of quite a different type: he had the straightest of straight Shire formation.

As a peripatetic advertisement for business he was invaluable; amateurish horse-fanciers raved over him, and talked of him about town as a noble animal. As a worker or breadwinner he was a fraud. Though the largest and heaviest horse—not in our stable only but in Brisbane—the smallest horse in the stable could take heavier loads; his straight form made him quite weak at a lift or when pulling up a steep pinch.

To continue indiscriminately crossing the oblique and straight formations can only serve to “pi the type” some more, and make improvement more difficult or rather hopeless of accomplishment.

Another decade or two at the present pace in deterioration of our horse stock, and the cheapest and quickest method of improvement will be to consign our stock of horseflesh as frozen meat to the continental markets, and start afresh on better and more intelligent lines on a new stock.

Poultry.

POULTRY NOTES.

BY F. T. JONES.

CLEANLINESS.

THE principal matter for the poultry-farmer to attend to is that of cleanliness: cleanliness of feeding, and cleanliness of habitation. Too much stress cannot be laid on these points; the health of the birds depends almost entirely upon their strict observance, and the poultry raiser who gives them his closest observance is acting upon that wisest of all maxims that "prevention is better than cure." To the negligence of these principles can be traced the majority of diseases to which the poultry-yard is liable. With regard to the first, it is a common thing to see soft food thrown on to the ground for the fowls to eat, generally in the same place every day. This is veritably giving an invitation to disease; the smaller particles which cannot be picked up rot and ferment, and, mixing again with the fresh food, give rise to worms, liver diseases, and kindred ailments. These undesirable results can easily be avoided by feeding all soft stuff in troughs. The troughs can be easily made by placing two pieces of board together lengthways in the shape of a V, and securing them by two oblong pieces nailed securely to each board across both ends; the long pieces should be about 3 feet long by 4 inches wide, and the short oblong pieces across the ends about 10 inches by 5 inches; eight or ten fowls can feed comfortably from each trough. The fowls, when not overfed, will pick the troughs clean, thereby saving food which would be wasted if thrown on the ground, and any danger of disease from careless feeding is done away with. The evening feed of wheat should not be fed in the troughs, but scattered about for the fowls to scratch for. Equal care must be shown in supplying fowls with water, which must be of the freshest and cleanest description to ensure the health of the birds; the drinking troughs or fountains should be placed where the sun will not heat the water, as water heated by the sun is a source of disease. A good form of trough can be made with a long shallow box, about 2 feet by 5 inches by 2 inches deep, with a small V-shaped covering over it, the same length and breadth as the trough and sufficiently high above it to allow the fowls to drink from the trough without being able to stand on or in it. The trough can be made watertight by being well caulked and tarred—on no account should it be painted, as the white lead in the paint is a poison. The trough should be kept perfectly clean and filled with fresh water at least once a day. This is a cheaper form of a water-supplier than the earthenware self-filling fountains, and has the advantage over the latter that it can be cleaned with much less trouble; it may perhaps require a little more attention, but the water from it is of a fresher description than that from a fountain.

And now with regard to the habitation of the fowl. Cleanliness should take second place to nothing in its observance here. The house would be better if cleaned out regularly once a day; but twice a week will be sufficient if the droppings are covered up every morning with sand or loose earth and carefully removed on these two occasions, and once a week a little lime should be sprinkled freely about the floor, especially where the droppings fall. The whole house should receive a thorough cleaning out at least once every three months, and be well lime-whitened inside. The roosts should be taken down, and if bearing any trace of rot replaced by new ones, and all of them should receive a coat of kerosene. If necessary, through the presence of vermin, the house should be thoroughly fumigated with fumes of sulphur.

The greatest care should be taken in placing poultry in a house which has been disused for some time ; for if, as is generally the case, the place has not had a thorough cleaning when previously abandoned, it will be a regular hotbed of disease and vermin, and no trouble should be spared in thoroughly cleansing it before re-using. The poultry-yard itself, especially if of small dimensions, should receive its due attention in this matter of cleanliness, and in no case should the refuse from the fowlhouse be placed where the fowls can scratch amongst it. Time spent in the smallest matter of detail in cleanliness is never wasted where fowls are kept, for it means time saved in attending to diseases which may otherwise accrue if this matter is neglected.

THE HELPFUL HEN.

LEGHORNS.

LEGHORNS are the best known of egg-producing varieties. They are the premiers in laying, and the standard by which the prolificacy of other breeds is judged. White and brown Leghorns were the first varieties known. The Leghorn fowl holds the same place among poultry that the Jersey holds among cattle. The question of profit in poultry has been decided in favour of egg-producing breeds. They are lively, active, and of a restless disposition, the best of foragers, and will pick up a good part of their living during the year. Leghorns are light eaters, and the cost of raising them to maturity is about one-half that of the Asiatic species. They mature early, feather quickly; the pullets often begin laying when four months old, and cockerels crow at the same age. They are the best layers, averaging between 150 and 200 eggs per year. Their eggs are pure white in colour, and weigh about ten to the lb. As table fowls they are fairly good. The only thing that can be said against them is that they are small in size. Altogether, they are one of the most profitable breeds of poultry that can be kept on the farm, and the cheapness of their keeping will allow the raising of two Leghorns for the cost of one Asiatic. In shape, a Leghorn cock should be graceful, body round and plump, broad at the shoulders, and tapering down towards the tail. The tail should be well balanced on a fair length of shank and thigh, the length of leg giving the bird its sprightly and proud carriage. Closeness of feathering adds to the general shape, and secures a freedom from angles, which always proclaims the purebred typical specimen. The breast should be full, beautifully curved, rather prominent, and carried well forward. Neck long, well arched, and carried erect; back of medium length, with saddle rising in a sharp concave sweep to the tail; tail large, full, carried upright—the full flowing tail and long well-curved sickles are characteristics of the bird which are much thought of. The wing is long, well-folded, and tightly carried. Hackle and saddle feathers long and abundant, and flowing well over the shoulder and saddle. The legs are bright-yellow in colour and free from feathers; toes also yellow, but a dark shade on them is allowable. The head is the prettiest portion of the bird, being short and deep, yellow beak, full bright-red eyes and bright-red face. The comb is single, of medium size, perfectly straight and upright on the head, free from side sprigs, deeply serrated with five or six points, and bright-red in colour. The comb should extend well back over the head, with no tendency to follow the shape of the neck. Earlobes, white or creamy white.

The Leghorn hen in many respects resembles the cock, excepting carriage of comb and sexual differences. In shape and carriage the hen is even more graceful and sprightly than the cock; very close in feather and rather small in body, though somewhat long in back. Her breast is full, very round, and carried high; legs fairly long, and shanks thin; tail carried closely and well up. The general carriage should be upright. Her comb is the marvel of her

beauty; it is single, and falls gracefully to one side, but not in a limp manner or so as to obscure the sight. Legs, comb, and face are the same colour as in the male, but the earlobe is much smaller and more round in shape. There are six standard varieties of Leghorn—Black, Brown, Buff, Dominique, Silver Duckwing, and White.

As to the number of eggs a Leghorn will lay, there is no difference between the brown and white varieties except in colour. A flock of six hens will lay more proportionately than a large flock. We have had hens to lay just as many eggs the seventh year as during any previous year; and after a pullet becomes a fully matured hen—say one year old—she will lay as many one year as another until eight years old. It is a grand hen that will lay 180 eggs a year. Hens have done so, but, like horses with records, they leave all others behind. We have known four hens, all of a small flock, to lay 604 eggs in a year, or 151 each; but we have never found 100 hens to average over 100 eggs per hen per year.

The reason is that in a large flock some hens lay none at all, from various causes, while others lay more. One with large flocks, after allowing for sick hens, overfat hens, lousy hens, and feeble hens, will be fortunate if he gets nine dozen of eggs from each hen in the flock. True, some of the hens may lay twelve dozen eggs in a year, but “one swallow does not make a summer.”

THE PLYMOUTH ROCK.

This is the best known of the American breeds. It has been, since its advent into popular favour, the every man's bird—the farmer's, the amateur's, the fancier's. Combining, as it does, quick growth, strong laying qualities, excellence as a sitter and mother, and hardly equalled as a table fowl, it is not to be wondered at that it has reached this well-deserved degree of popularity. Its heavy feathering and small head appendages place it in the front rank of the cold weather breeds. When a Leghorn would shiver and freeze up in a zero blast, the Plymouth Rock would be up and doing, with the result a full egg-box. As sitters and mothers they have few equals. They are hearty eaters and good foragers, gentle and quick in disposition, taking on flesh rapidly as growing chicks, soon attaining plump broiler size; and if left over for roasters, they present full, round yellow carcasses. They have but few faults. Their greatest is perhaps their tendency to over-eat and become too fat for egg-production. The Wyandotte is its great rival. Wyandottes grow quicker as chickens, standing all the forcing possible, maintaining a plump, round body from six weeks old to maturity, which is about one month earlier than the Plymouth Rock. They lay as many eggs as their rivals. They are more plump and round in body and shorter on the legs. As a dressed carcass either as a broiler or roaster, they present the finest possible appearance. They are good eaters and better foragers. Still, given good care and treatment, the Plymouth Rock will discount all others as a general purpose breed. They should be kept pure. A first cross may do very well, but should you go any further you will have mongrels for certain—chickens with as many colours as was Joseph's many-coloured coat—chickens white, black, speckled, mottled, variegated, ring-streaked, and striped. The first cross is seldom if ever as good as the thoroughbred in every respect.

EGGS V. BUTTER.

Mrs. Helen E. Bailey writes: My indifferent friend, do you not know that the poultry profit beats that of the dairy all to pieces, all things considered; that there is more profit in selling eggs at the low price of 7 or 8 cents ($3\frac{1}{2}$ d. to 4d.) per dozen than there is in selling butter at 15 cents ($7\frac{1}{2}$ per lb.)? A pound of butter a day is a good yield for the average cow, and the food consumed by that cow would, if fed aright, be enough, say, for six dozen hens. Now, supposing I get but two dozen eggs a day, with the price at $7\frac{1}{2}$ cents per dozen, that just evens your pound of butter. But should the number be

three dozen, I am $7\frac{1}{2}$ cents ahead, do you see? There is the broody and moulting season, when the egg-basket runs low, I know; but does not your cow have her lay-offs as well? Does she not fail of a full flow of milk sometimes from other than natural causes? True, my hens may be mainly idle during the winter, while you in the meantime are producing 20-cent butter; but should they give me but one dozen eggs a day, at 20 cents a dozen, I am still even, till during warm weather, when you are making cheap butter from grass, I far outstrip you solely by virtue of numbers. Now here you are worsted in the game; for while you have to be doubly careful to get your butter in marketable shape, I am filling my basket with a commodity already prepared. Here lies the advantage in that I realise my profits with less labour and worry than you do.

SETTING A HEN.

Beginners are apt to make the mistake of putting as many eggs under a hen as she can cover, believing as long as she can spread herself over them that she can hatch chickens out of them. The truth of the matter is, that to bring chickens out of eggs she must have no more than she can hug up to her and keep warm. During the spring, or except in the hottest of weather, twelve to fifteen eggs are a great plenty, twelve being the safer number. Give a hen thirteen eggs, and she will bring out twelve chicks nine times out of ten; give her eighteen or twenty, and she will hatch from four to ten. You had better sell the extra half-dozen than let the hen rot them in a vain endeavour to bring chicks out of them. I have known hens in midsummer to steal their nests in the brush or weeds where they were sheltered from the wind, the sun having a fair chance all day to heat up the earth and atmosphere, to bring out eighteen chicks from twenty or even twenty-two eggs; but it is the exception, not the rule. You will find that thirteen eggs to the hen will, during the season, bring you a greater number of chicks than more, for every fertile egg that lies against the warm body of the hen is bound to bring forth a lively chick.—*Report of Kansas State Board of Agriculture.*

Cabbage is one of the very best vegetables to feed to poultry, as it keeps green a long time, and the chickens enjoy picking at it. Hang it up where they can eat it readily without scattering it about or soiling it.

Never feed whole egg-shells to hens. By doing so you teach them to eat their eggs. Crush up the shells finely and scatter the fragments where the hens and chicks will pick them up. Never mix the shells with soft food.

If hens take to flying over fences, it is your own fault. You cannot cure a hen of the habit once she has discovered her powers of flight. Prevention is the cure. We know that Satan finds mischief for idle hands; so an idle hen gets into mischief, and there is no limit to the mischief done by a hen in her wrong place. Give her some work to do in the yard or paddock in the way of scratching and food-hunting. She will not then look over the fence.

The Orchard.

FRUITGROWERS, PAST AND PRESENT.

By A. J. BOYD,

Queensland Agricultural Department.

THE present condition of the fruitgrowing industry, as compared with its position thirty years ago, is well worthy of attention. I think that a short account of the usual method adopted by old-time orchardists (not including, of course, fruitgrowers who had graduated in the business, although they were like plums in the midshipman's duff—few and far between) to establish private nurseries and orange groves will be a good object lesson for those who are but now entering into the business.

The first thing to be done was to secure a bit of land. In those days, land near Brisbane could be bought for £1 per acre, or by means of a land-order given to immigrants on arrival in the colony, which represented £40 in cash.

The land, good, bad, or indifferent, being secured and a portion of it fenced in, the next thing to be done was to set to work to clear and cultivate it. Some men, *quorum pars fui*, which, being interpreted, signifies "of whom I was one," would take a look round at their neighbours' older holdings. There they would observe what the farmer was pleased to call his orchard. This usually consisted of a clump of self-sown peach-trees, which served the dual purpose of fowl-roosts and supports for the family clothes-line. Often the family dog was chained to one of them, and the family swing hung suspended between others.

The observant new-comer, having read something about "scented orange groves" and "spice-laden zephyrs," determines that he will eschew the peach and go in systematically for an orange grove. By systematically is not meant here growing on a system, but it implies going in wholesale for planting orange-trees. Having nothing to guide him, no neighbouring groves from which to gain a lesson, no guide, philosopher, and friend in the shape of an expert in the science of fruitgrowing, he goes about the work in a blind, ignorant fashion. He has a general idea that fruit trees should be planted in straight rows, and that this can be achieved by the help of a clothes-line and some pegs. As to the distance at which they should be planted, he has not the remotest idea. The trees are very small, he thinks, and 10 feet apart will be ample, and allow of getting in 435 trees to the acre; the reasoning being that the greater number of trees he can cram into an acre, the greater will be the future profit. He now marks out his ground, and looking along his line of pegs he sees that they are in exact line, but when the idea strikes him to look across the lines at right angles he discovers that the pegs are not in line in that direction, so he first shifts one, which necessitates shifting a hundred more, and then he finds that in trying to mend matters he has only made things worse, so he at last determines not to bother any more but to dig the holes for his trees—none of your little holes, but large capacious chasms, 4 feet square and 4 feet deep. He finds a stiff clay bottom, which greatly

rejoices his heart, for the hole will hold water and keep the trees nice and green in dry weather. If he had it, he would put a couple of feet of rich manure into the hole for the roots to feed on.

All the holes being now ready, he casts about to get trees, and he is fortunately able to pick up a few odd lots—nicely labelled—a great bargain in an auction-room, where they have been put up for sale in bundles for the last two or three days, and have failed to find a purchaser. Meanwhile he has been advised to send to Sydney for a large supply, and these arrive perhaps ten days after they have been lifted from the orchard in Parramatta or elsewhere. The roots are nicely bound round with a strip of canvas, and the trees have enjoyed a breezy passage on the deck of one of the old-fashioned steamers of that day. They have also further been refreshed by copious “douches” of salt water from the deck hose, after a day spent in the broiling sun. They are all named and carefully labelled. That is never forgotten, and thus our friend finds himself the happy possessor of so many Emperor mandarins, so many Navel oranges, so many Acme-Blood-Maltese oranges, with lemons to match. Now he goes in for hard work at planting. For the present the roots of the trees are placed in trenches and covered up till he is ready for them. He has never heard how an orange-tree should be planted, so he seizes a tree with a lot of straggling roots, and places it carefully in the middle of the hole on top of the manure and shovels in a foot of earth. Then he jumps into the hole and stamps the clay firmly round the roots with his boots, probably regretting that he has no rammer at hand. When the hole is full he throws up a nice mound about a foot up the stem, slopes it off well, flattening the soil hard down with his spade, then steps back with conscious pride at his achievement, congratulating himself that the winds may blow, but a hurricane force will not root that tree up, for is it not planted 2 feet below the surface! As for a drought he can defy it, for are not the holes water tight? *Ergo*, they will always retain sufficient moisture for the roots. His next proceeding is to collect all the citrus seeds he can lay his hands on. He buys oranges and lemons, and sows his seeds. He buys damaged oranges and lemons from the fruitsellers. Little he recks of fruit-fly larvæ in the rotten fruit, for he knows nothing about fruit pests yet. He is getting experience.

Now three months pass away. He cannot understand why a number of his young trees are dying off, leaving a dry brown stem in place of the green one he planted. But he is greatly cheered by observing a healthy green shoot springing from the root. Of course he has lost a great number of his Sydney and auction bought trees, but he has filled up their places, and is serenely conscious by the second season that very few of his trees are dead. So year after year for four or five years he extends his orchard till he has 10 or 15 acres planted, *all living*. Now his first trees begin to flower, and he then sits down and makes a calculation. He has been told that some trees will bring him in £5 per tree; indeed, he has heard of lemon-trees producing £10 worth of fruit in a season. Others, however, may produce very little, so he reckons that on an average his trees may return him £1 per tree. Now he has planted some 400 trees per acre; that will yield £400 per acre. Hence his first 5 acres—all grafted trees of the best kinds, as per label—will return him at least £2,000, and a few years later, when his whole 20 acres are in full bearing, he will be able to sit down, a made man, with a very large and certain income.

But he has forgotten one little circumstance. Every week he finds some trees turning yellow; then the leaves drop off, and eventually, after a sickly struggle, these young trees bid farewell to the world, and have to be replaced. He cannot tell why they die, so that when the fulness of time arrives, when he expects to reap a golden harvest, he finds he has but a fraction of the crop he had reckoned on, and, worse than all, the major portion consists of that delectable fruit known as the rough sweet lemon. He has planted well-labelled

trees, and he gathers sweet lemons. What can it mean? There was no one to tell him what was the meaning of those pretty little green shoots that sprang from the root when the main stem died off. The wily auctioneer and the more wily Sydney agent are things of the past; they exist no longer, and cannot be inquired of. But all is not told.

Some of the trees made noble stems "twelve inches in circumference, sir"; but, somehow, in spite of the amateur pruning-knife, branch after branch withers away, the "dieback" becomes conspicuous, and then the stems and branches become covered with a whitish-grey substance which spreads into the topmost shoots. What can it be? The glossy green of the leaf becomes hidden under a covering of a black, scaly, smut-like substance; little black and grey round-backed shells fasten in myriads on to the underside of the leaf, and multiply exceedingly till they extend to the branches, which soon present the similitude of the scaly leg of an old Spanish rooster, and little mounds of wood-dust accumulate like small volcanoes around minute holes bored in the stem. He awakens at last to the fact that this is a disease, and he hies him to a learned seedsman, who forthwith sells him many pounds' worth of a cunning medicineycept "Gishurst's Compound." With this he washes his trees, but without avail—the disease increases. By-and-by he observes that more of the upper branches are beginning to die back, and acting under the advice of a neighbour he mulches his trees with various kinds of manure. Finally he goes to work with saw and knife, and cuts away all the dead wood. He is next told that the land should be drained. The simplest way to drain it is to cut trenches connecting the holes in which the trees stand. Still no good result follows, tree after tree dying away. The next man who comes along tells him that the tap-root has gone into the cold, stiff clay, and that the only salvation for his orchard is to cut off the tap-roots and insert a slab beneath the tree. Shafts are then sunk alongside each tree and a drive put in. The tap-roots are cut, and the requisite slabs are inserted. Surely, now that the trees are drained, manured, and prevented from going down into the clay with their roots, things must improve. So they do for a time, but now six or seven years have elapsed, and for one good orange-tree he has twenty whose fruit would not even be bought by the most unscrupulous manufacturer of pumpkin and pie-melon strawberry jam. Besides this, they are dying at the rate of a couple of hundred a year. So he comes to the conclusion that orange-growing is a delusion and a snare, and cannot by any possibility become a paying business. He gives it up, and goes away a disgusted man to grow corn and potatoes somewhere else.

All this has actually taken place, and the writer was amongst the victims. Had the same amount of energy and capital been expended in the present day in a district suited for the citrus fruits, no such misfortune could occur. To-day we have a fruit expert, whose life has been spent in the study of fruit cultivation. On starting an orchard, the beginner has merely to apply for instruction to the Department of Agriculture, and at once full directions are given as to the proper method of starting an orchard with great probability of success.

Mr. Benson, the fruit expert, who is also Director of State farms in Queensland, will make a journey to the locality and keep in touch with the tyro orchardist, taking care to see that each successive step is properly carried out. No swindles, under his direction, are possible in the way of imported fruit trees, whilst our own nurserymen naturally only sell trees true to name, if only for their own credit's sake. When disease appears, full assistance is given to combat it, and all possible endeavours are made to keep new pests out of the colony by means of rigid inspection of trees and fruits and seeds arriving

oversea or overland. Thus anyone proposing to start fruitgrowing to-day does so under vastly different conditions to those under which the pioneers of the industry began it forty years ago, and they start with every factor to success in their favour.

STRAWBERRY CULTURE.

By A. PITMAN CORRIE.

STRAWBERRY culture is quite a fine art, and when one has learned it he has reason to be as proud as the man who, by self-help, has attained a degree of mental culture. Such at least is my idea. But the eye with which I view the strawberry may have a squint. Judgment may be warped; I may have a prejudice in its favour, for I remember that that which moved me profoundly in reference to the strawberry was not—its flavour, over which some go into raptures, but—a book written by an M.A. of Cambridge, entitled “How to grow, how to pick, and how to eat—[mark you! *how to eat*!—the strawberry.”

Of this volume I could not say—

So by false learning is good sense,

but accepted it with its defaced hall-mark of wit and learning. It seemed to shed a halo of glory around the strawberry, and at once made its culture, instead of a prosaic occupation, a fine art indeed.

Now, 'tis true the strawberry is only a very “little member,” but those who cultivate it appear to have been profoundly influenced in its favour, for they usually boast great things concerning it; and—they are justified. Consider, for example, the growers of Razorback, Blackall Range. Allowing journalistic latitude (which, by the way, must not be confounded with poetic license), we may say of them, “They toil not, neither do they spin.” Not that they have discovered the art of living without work, but seem to have discovered the art of getting the greatest out of the least. And the discovery of this is of more importance than the discovery of the Philosopher's Stone so long, and vainly, sought.

The returns these growers obtained last season are astonishing, and the figures form highly palatable food for reflection. One producer, in conversation on the subject, said, “I will not tell you what I made last season from a plot measuring an acre, because, if I did, people would discredit the statement.” And neither will I speak concerning the profits of the past harvest, nor predict respecting the incoming season, for the figures might appear fabulous, and the speculations quixotic. But I cannot refrain from winking the other eye in a knowing way, and dropping a hint in passing. Now, when the grower gets 2s. a quart, and can, in the height of the season, pick twice a day, his returns ought to be fairly large!

Yet, with respect to Razorback, when the settlers now in occupation began to go thither their friends thought it a crazy enterprise. Razorback has an altitude of nearly 2,000 feet above sea level, and is inland about five miles from the North Coast line, Palmwoods being its railway station. Four or five years ago it was an inaccessible spot, but since then fair roads have been made. However, the ascent of the range is still abrupt and continuous, the climb arduous, and the journey quite an undertaking. But from the summit of the range a grand panoramic view is presented—a sweeping view, unfolding northwards and southwards with the broad Pacific at the base of the everlasting hills. The outlook alone is considered ample reward for the climb. The soil, too, is splendid—chocolate-coloured and of great depth. The greater part is scrub land, and when felled, burnt off, and light and air admitted, the soil becomes friable and most prolific, granting its “bliss at labour's earnest call.”

Plate XIII.



PICKING STRAWBERRIES.
BLACKALL RANGE.

Naturally enough, the struggle the early settlers had was a desperate one. It was against odds, and often, indeed, against hope. But they were stout-hearted, stuck to their guns, and last season the strawberry crop rewarded their faith, and has opened up a bright vista for the future.

Now the secret of success in strawberry culture is to have early fruit. You must catch the first market, or, better still, create it by having the first ripe berries of the season. In the course of a few days, or in a week or so, the glamour and glory of the first flush is gone. The price rapidly falls—or did last season—from 2s. to 1s. per quart. Then, when the excitement of getting the first yield of ripe berries for table purposes has abated, the time has arrived for picking the surplus fruit for jam. These berries—all sorts and conditions—having the “nib” removed, are thrown into kegs provided by the jam-makers of Brisbane. It is called “pulp.” For pulp the growers receive 4d. per lb. This pays well, and the demand was so steady last season it is expected that the price will keep up.

The strawberry is a delicate fruit, and when needed for table use requires careful packing. This will be better understood when one keeps in view the fact that Sydney is sometimes the destination for the first crop. The packing cases used are very shallow, and made of pine, split in the “scrub” adjacent to the strawberry plots. The cases usually hold from 3 to 6 quarts. Packing is what some would term a finicking job, and, perhaps, better suited to women than men. But “all hands and the cook” usually turn out when the strawberry season is in full swing. The juvenile members of the community are at a premium at such times, and those who have large plots under culture bespeak all the available labour. In California the general fruit harvest is a time of exceptional activity; and as it is *not* accounted *infra dig.* for ladies of refinement to take part in picking, the fruit season is a time of social intercourse. Similar conditions may prevail some day at Razorback.

The strawberry is a wonderfully prolific plant, but, in order to keep up productive activity, experience has taught the growers of Razorback to plant anew each season. The great fertility of this marvellous little plant is demonstrated about two or three weeks after the first ripe berries are picked. If one happens to visit a grower's place when he is watching, with almost breathless excitement, the few fast-ripening berries which herald the approach of the season, he will be given to understand that the order of the day is, “Hands off.” But if he returns when the season is at its height, the grower will almost implore him, and his friends, to come and eat to their hearts' content, so as to prevent waste. Yet, in spite of the incessant picking for market, and the incursions of visitors and friends, it is usually impossible to cope with the supply, and quantities of berries are lost through decay.

The following facts were supplied by a Razorback grower, who has made strawberry culture a decided success:—

Six thousand plants to the acre.

Kinds—Marguerite chiefly, being early and good bearers.

Commence planting in February.

Continue to middle March.

Turn soil with fork to depth of 10 inches; reduce to a fine tilth.

This is especially needful where soil is porous.

Plants commence to bear first week in August.

THE MEXICAN STRAWBERRY.

WE have just received from Mr. S. L. Watkins, of Grizzly Flats, the following account of the Mexican Strawberry mentioned in our last number:—

The Mexican or Arizona (S).—A berry of surprising merit, wondrous beauty, and luxuriant plant growth, is the Mexican Strawberry. It is a rapid and beautiful grower, with clean, healthy foliage of a dark-green colour. The young plants of this variety need no petting, but take hold and grow rapidly. Generally these young plants perfect a heavy crop the first season. A strange peculiarity of the Mexican Strawberry is that it will yield fruit for five or six years without renewing, as against three or four crops with other varieties. It gives heavy crops all through the season; in warm climates it yields two crops a season. The berries are larger than those of any other variety cultivated at the present day. I have all the new and old varieties, embracing about 300 kinds, and I have a good chance to determine their value. The Marshall, Monarch of the West, Great American, Sharpless, Enormous, Australian Crimson, La France, Glen Mary, Brandywine, Rival Hudson, Enhance, &c., are among the larger berries, but the Mexican is better than any of these because it will average two quarts of fruit to the plant, and in exceptional cases three and even four quarts. The plant itself is almost faultless, attaining a height of about 16 inches, with dense, spreading dark-green leaves, which greatly protect the blossoms from frost. Last year the cold weather destroyed nine-tenths of the flowers on other plants, but the Mexican pulled through in splendid shape and gave an enormous crop. The fruit is slightly conical in shape, and is brilliantly coloured with a fine lustre. In flavour it is rich, sweet, aromatic, and altogether delicious. It is a wonderful market berry.

The price of these plants in the United States and Canada is 1s. 5½d. per dozen, or 6s. 3d. per 100.

Viticulture.

CELLAR WORK.

By E. H. RAINFORD,
Viticulturist, Queensland Agricultural Department.

IN Southern Italy it is customary, when the must has been put into casks to complete its fermentation, for the proprietor to stick a penny print of some saint on the head of each barrel, and leave it thenceforth to the exclusive care and guardianship of his patron. The practice is a pious but an unwise one. Many members of the saintly community appear to be too much occupied with more serious matters to attend to these details, to judge from the amount of wine that goes bad. The Anglo-Saxon, as a rule, prefers to attend to his mundane affairs himself, but there is no denying that some colonial vigneron, with the exception of the penny print, follow pretty much in the steps of their Latin brethren.

Few things require more care and watching than young wine, and the vigneron who gives it his unremitting attention will reap his reward later on. Theoretically, good must from a good grape should ferment unassisted into a good wine, and it frequently does so, but there are many gradations between a perfect wine and vinegar, and in the majority of cases it will turn out somewhere between the two points, according as more or less care has been paid to it in its preparation, fermentation, and after-life. So many influences affect adversely the composition of must and its change into wine—such as the care expended on the cultivation of the vine, prevalence or not of disease of the vine and grapes, amount of rainfall before and during the vintage, an abnormally high or low temperature during the fermentation, &c.—that the perfect balance of the component parts may be upset, which is provocative of an unsound or irregular fermentation, and will necessitate the watchful assistance of the vigneron.

WHITE WINES.

Before proceeding further, it must be explained that the word “wine” in the following remarks is used to express the partially fermented must or new wine.

It is a common practice to leave both white and red wines to become perfectly clear before the first racking takes place. In the case of white wine this is a mistake. White must that has been run into the cask directly from the mill contains a much greater quantity of albuminous substances than red; the latter has been purified by fermentation with the husks and stalks, which has the effect of removing a considerable amount both by the chemical action of the tannin and by the mechanical action of the marc.

These albuminous matters are very prone to decomposition, the effect of which would be to spoil the aroma of the wine, give it an unpleasant earthy taste and foxiness of colour, besides leaving the wine liable to further alterations; no time, therefore, should be lost in removing them. After the first fermentation is over and the wine has entered into the after fermentation which slowly decomposes the remaining sugar, the bulk of the albuminous matters will be deposited in the gross lees; and although the wine is still more or less milky, the vigneron should not hesitate to rack the wine into a clean cask. The cleanliness of the cask cannot be too much insisted upon; it should be well washed out with clean water and then sulphured, or, better still, rinsed with fresh water acidulated with 5 per cent. of sulphuric acid, and well drained. If sulphur is employed, avoid burning too much, or it may check the fermentation of the wine racked into it, which would cause

some inconvenience. The object of the sulphur or acid is to destroy any germs that may have entered the empty cask, which would find a very favourable medium for reproduction in the warm, still sweet, wine or must. When racking, use a pump if possible, and avoid too much exposure to the air; fill the casks as full as possible, and bung lightly to allow the escape of the carbonic acid.

Red wine, as above explained, contains much less albuminous matters, and can be allowed to follow its after fermentation without racking until clear.

OUILLAGES.

Considerable difference of opinion exists amongst wine experts as to the advisability or not of filling up the casks during fermentation—an operation called by the French “ouillage.” Some writers advise it, whilst others emphatically condemn it, but an examination of the arguments for and against the practice, as well as a considerable personal experience of the matter, has led the writer to side with the latter. Its object is to prevent the entry and reproduction of the germs of acetification, which would have a larger surface of wine to act upon than if the cask were kept filled. But so long as carbonic acid gas is being generated and expelled from the bung, there is small chance of their entry. As soon as fermentation becomes silent the wine should be racked and the casks kept filled.

But against the risk incurred by not filling up the casks, must be weighed the far greater danger of infecting the whole wine with dangerous germs which may exist unnoticed in the wine used for the purpose, for it is usual to set aside a small cask for “ouillage,” and, should this wine contain germs of lactic fermentation (a fact that might be easily overlooked by a careless vigneron or his assistant), all the wine with which it is mixed will be exposed to the same danger, and it is a danger that is recognised by the advocates of the practice who unite in insisting on great care in the choice of the wine to be used. Now, all vignerons are not sufficiently expert to be able to distinguish lactic or other dangerous fermentation in its early stages, and some may be too careless in their examination of the wine used. Another objection to the practice is, that the casks may be filled up with wine at a different stage of fermentation which might interrupt or modify the march of fermentation of their contents—a risk to be avoided. For these reasons the writer is of opinion that the risks attending ouillage before the first racking are greater than those incurred by not adopting it.

Many French vignerons use a plug of medicated cotton wool in the bung, which cleanses the air that passes of any germs, the plug being put in after the tumultuous fermentation is over. The system of fixing a bent tube in the bung with one end dipping in water is also good, if care is taken that it be not left in after carbonic acid ceases to be generated; otherwise you run the risk of a vacuum being formed and the water being drawn into the cask. As a rule when gas ceases to form it is time for the first racking.

LACTIC FERMENTATION.

During the period of the after fermentation, the vigneron should frequently examine every cask of new wine to observe if the fermentation is pursuing a regular course. This is judged by the taste, but more by the smell and colour. Sound wine will have a pleasant, fruity smell due to œnanthic and tartaric ethers, but should lactic or butyric fermentation set up, as will sometimes happen towards the close of the vinous fermentation, the expert vigneron can at once detect the fact from the acidity and by the peculiar and somewhat disagreeable odour of the ether developed by these acids—in some cases it gives an idea of unsound cider, but the smell varies with varieties of wines. Any vigneron in doubt as to whether a particular cask of wine has passed into lactic fermentation, should send a sample to the Viticulturist at the Agricultural Department to be reported upon.

Should lactic or butyric fermentation set up, it is due to either too elevated a temperature during the tumultuous fermentation, which paralyzes the activity of the *Saccharomyces ellipsoideus* whilst it develops the noxious bacteria, or else sufficient care in the cleanliness of casks and utensils has not been observed, and germs have entered the must. A microscopical colony of germs in an empty cask is quite sufficient to infect the wine or must put into it. Whatever the cause, it is necessary to stop it without loss of time, if the wine is to be saved. The proverbial three courses are open to the vigneron—the first, by strongly fortifying the wine, which destroys all germs. Fermentation ceases, and leaves the wine clear and more or less sweet. This course is possible for certain classes of wines from musts of high density, but would hardly do for light white or red wines. The second course is pasteurisation or destruction of the germs by passing the wine through a medium which raises its temperature to 150 degrees. To do this requires a special apparatus called an œnotherme, seldom possessed by the colonial vigneron, although it is one of the most useful machines he can have in the wine cellar, for it may be called the wine-preserver. Wine periodically passed through the œnotherme, at a nominal cost, ensures its absolute immunity from bacterial assaults, to which most maladies are due, by destroying the germs that may have surreptitiously entered it.

The third course is to check the fermentation by racking the wine into well sulphured casks, or, better still, by the addition of 30 grammes, or 2 oz., of bisulphite of lime to every 20 gallons of wine racked over. If this does not clear the wine, the operation must be repeated. The action of the sulphurous acid or bisulphite is to kill or paralyse all the germs of whatsoever description, and they fall with the lees to the bottom of the cask. If the wine should not become perfectly clear it must be fined to make it so. Directly the wine is bright it must be again racked, taking the utmost care that *none of the sediment* goes with it, otherwise all the work will have been in vain. A single quart of sediment, if allowed to escape with the clear wine, is enough to infect it with the noxious germs.

The object of the whole operation is to concentrate the germs from the wine into the sediment and remove the cleared wine off it, and the vigneron must throughout keep this end in view.

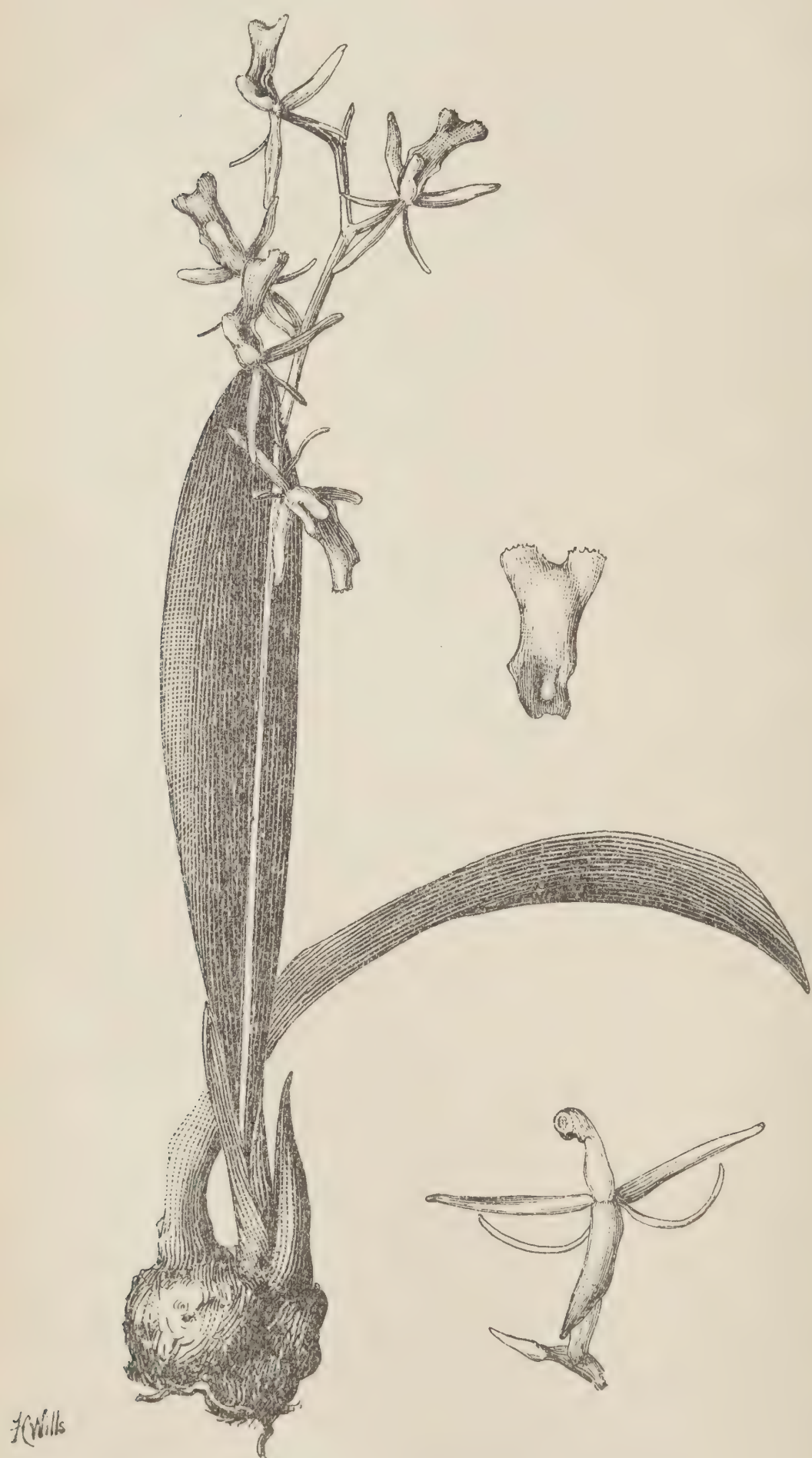
On racking off the clear wine, it must be aerated as much as possible to favour the oxidation of the sulphurous acid, and to this end it should not be pump-racked, but by tap and bucket, giving as much distance as possible for the fall to make a splash and well aerate it. To restart the vinous fermentation, the wine can be racked on to fresh lees of new sound wine, or some gallons of fermenting must can be mixed with it; the greatest care should always be taken of the cleanliness of the empty cask as before mentioned. Fermentation will be slow at first until the sulphurous acid has been oxidised, to hasten which another racking may be necessary, but it will be a sound vinous fermentation, and sound wine will result. The whole operation is far easier than appears at first sight, and if a little expense is incurred by the several rackings it is a small loss compared to the loss of the wine.

RACKING.

As mentioned above, the new white wine should be racked when the tumultuous fermentation has ceased, and a second time when it is bright. Red wine can be allowed to remain till it is bright, if “ouillage” is practised; if not, it should be racked when carbonic acid ceases to escape from the wine. When racking light wines, avoid exposing it to the air as much as possible, and to that end rack with a pump, the end of the delivery pipe to be well down into the empty. Lightly sulphur the empties for sound wines; the abuse of sulphur is very common, wines reeking of it for months after racking; what is useful in a moderate amount becomes hurtful when in excess.

Never rack into a cask that has contained unsound wine, unless it has been carefully disinfected and cleaned out. Smell each cask before you use it, and discard all that have the slightest taint of sourness, mouldiness, or woodiness. The preparation and cleansing of these and new casks will be given on another occasion. Avoid racking when the air contains much humidity; choose dry, bright weather for it.

The fortified wines of 30 degrees and upwards, on the contrary, should be racked by tap and bucket with as much aerification as possible. The more the wines are oxidised, the sooner will they mature and acquire the bouquet and softness of old wine. Germs cannot influence the wine in any way, as its alcoholic strength paralyses their action, except in rare cases of wines very badly prepared. A small addition of alcohol should be made at each racking to compensate for the loss by evaporation, &c.



H. Vills

Liparis mobulana, Bail.



1. *Crinum pestilentis*, *Bail.*

2. 3. 4. " *brevistylum*, *Bail.*

Botany.

CONTRIBUTIONS TO THE QUEENSLAND FLORA.

BY F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

Order MYRTACEÆ.

EUGENIA.

E. Bungadinnia, *Bail.* (n. sp.) Aboriginal name at Somerset, *Jardine*. Tree of from 30 ft. to 40 ft. in height, stem diameter about 3 ft., bark loose, inclined to be papery (F. L. Jardine). Bark upon the thick branches peeling off in very thin cinnamon-brown papery flakes; branchlets often flattened, the bark dark, hard, and smooth. Leaves lanceolate obtusely acuminate, tapering from above the middle often to the branch, or forming a petiole a few lines long, 2 to over 3 in. long, $\frac{1}{2}$ to 1 in. broad, of a somewhat coriaceous texture, the parallel lateral veins and the intermediate anastomosing veinlets faintly prominent and joining the intramarginal one near the edge, both faces dotted, the underside rather paler, and thus the dots more plainly visible. The loose fruit received with the shoot-specimens were transversely oval or oblong, and measured 2 in. broad and $1\frac{1}{2}$ in. high. The remains of flower seen on the fruit 2 to 3 lines diameter. Calyx-lobes 4, 1 line high, $1\frac{1}{2}$ lines broad. Stamens seem to be in bundles of two or three, about 3 lines long. Style stout, about 6 lines long. Fruit examined 1-seeded.

Hab: Somerset, *F. L. Jardine*, who says that, as this is one of the first fruits to ripen, and coming at a time of scarcity, the natives almost live on it.

A NEW SPECIES FROM NEW GUINEA.

Order ORCHIDEÆ.

DENDROBIUM, Sw.

D. viridiflorum, *Bail.* (n. sp.) Stem, the one seen yellowish, about 4 in. long (said to attain 6 in.), from a bulbous base, slender, not more than a line in diameter, then increasing to 4 lines broad, compressed, contracted at the nodes, the internodes $\frac{1}{2}$ -in. long and prominently corrugated. Leaves several along the broad part of the stem, rather pale-green, somewhat twisted, linear, about 2 in. long, 4 lines broad, obliquely emarginate at the end, with a midrib, and a longitudinal nerve on either side midway between the midrib and the margin, erecto-patent and attached horizontally to the thin edge of the stem; sheaths persistent, turning a rather dark-brown. Flowers nodding, green (except the labellum and column), solitary. Peduncle at the base of the leaf-sheath under the leaf at the same node, about 5 lines long, slender, recurved. Sepals reflexed ovate lanceolate, dorsal 2 lines long, the lateral ones same length but elongating and with the base of the column forming a spur, nearly as long as the pedicel. Petals green, with a very narrow white margin, linear, rather blunt, long as the sepals, but scarcely more than half as broad. Labellum white, much larger than the other segments, fleshy, 3-lobed, lateral lobes erect, oblong, tomentose on the upper margin on the inside, tapering towards the base, the upper end truncate, rather distant from the middle lobe which when spread out is very broadly-cordate and apiculate; disk-plates 2, thick and rather high along the upper portion of the claw, and extending about half-way up between the middle lobes. Column short, thick, and white. Anther-lid flattish, cream-coloured; rostellum thick, 2-lobed, or emarginate. Pollen masses amber-coloured.

Hab: New Guinea. The above description is from a specimen received from Mr. Hugh Dixon, of Sydney, which was taken from a plant flowering during November last in his orchid-house. He writes me that he had the plant from Captain Steele, of the "Ivanhoe," about eighteen months ago.

Horticulture.

ASHES AND CHARCOAL—THEIR VALUE AS FERTILISERS.

By R. R. HARDING.

Curator, Botanic Gardens, Toowoomba.

WE who live in this colony and have to deal with Nature's processes, which are the source of material wealth, are apt to forget that we are in the midst of a great university, with numerous courses of study before us, and the means for a broad education within our grasp. The question constantly confronts us: Shall we sacrifice this education because we are not willing to look further than the acquirement of means to obtain existence? The motive of all science is the attainment of truth, and many men's lives might be turned to better account were they to turn their faculties to unravelling the secrets of Nature. Nature, at all events, can never be wrong; anyone who is seeking to read Nature can never do wrong by following her teaching, but nothing but actual experience can determine the fact, and also I think it will be admitted that the mind is more enlightened by practice than by mere study—practice makes perfect.

Long observation and study, together with the intimate practical experience acquired over a long term of years of close association with plants introduced into this colony will probably give some weight to the few remarks here given on ashes and charcoal, as I have found them the most natural, and in all respects the most economical, manures that can be applied to all plants, especially when they are so near at hand, but yet are allowed to go to waste. These, when used as fertilisers, not infrequently produce a greater increase of crop than their chemical composition promised; and this is all the more remarkable because the opposite is usually the case with fertilisers. The ashes contain all the mineral parts of the wood, and, as not much nitrogen is required, the ashes alone are sufficient. Suppose we were to burn an apple-tree, what is left? Ashes certainly; and as 50 lb. of these ashes contain 4 lb. of potash, this must have been the substance most largely taken from the soil by the tree. Apparently the potash in the ashes increases the production of available plant food in the soil by inducing or stimulating chemical action. This potash is a constituent of every plant, although some plants require a great deal more than others. The power of the potash in ashes to liberate nitrogen from humus is well known, and this action in making available the nitrogen in the soil is strikingly shown when land recently cleared of timber is put into crop. Wherever a heap of logs or brush has been burned, the vegetation is rank and luxuriant.

In the raising of trees and shrubs, my seed beds consist of ashes and charcoal, except a small amount of good soil on top for the seeds to germinate in and for absorbing the water, as it would be impossible to get the water to enter the ashes; and I notice that immediately the young roots get a firm hold of the ashes they make tremendous growth, and also find that the application of these ashes to the soil improves its capillarity, and therefore gives to the plants more moisture, increases the woody growth, and in all pot plants it gives the greatest satisfaction.

In a ton of ashes there should be about 140 lb. of potash in a form most readily available by the roots of plants, besides sufficient phosphoric acid and a small quantity of nitrogen, and the inorganic matter in the ash of a plant gives strength to the plants and enables them to give large produce.

But some soils have sufficient potash only in a dormant state; then a little lime will make it active. For instance, recently a lucerne crop on Talgai Station became less each year, and at last it was nearly covered with weeds. In the dry weather the manager decided to burn these off previous to ploughing. After this was done (the burning), rain set in, and in one week after the fire the crop showed signs of being as good as it was in the first or second season after sowing. I think the ashes did that, because if we were to burn 2 tons of clover hay we would have a large quantity of ashes, and this is what it contains:—Potash, 52 lb.; soda, 7 lb.; magnesia, 35 lb.; lime, 111 lb.; phosphoric acid, 20 lb.; silica, 10 lb.; and common salt, 3 lb.

To show that the ashes are also good for the orchard, we will take the orange-tree as an example. A ton of oranges removes from the soil 100 lb. of mineral matter, and 30 lb. of this is potash. We will say that an average crop of full-grown trees will be about 10 tons per acre, and we have thus a removal from the soil of about 1,000 lb. of mineral matter per acre per annum by an orange crop. This may go on for ten years, and not a single particle of these ingredients is returned except what Nature returns by an occasional crop of weeds; and still many wonder why their orchards become exhausted. But how many take into account the necessity for their growth? And as the largest proportion of the residue of the orange-tree is superphosphate of lime, the value of ashes to this tree cannot be over-estimated.

All kinds of fruit abound in potash, more especially in their seeds, and lack of potash in available form for use is probably one reason why fruit does not perfect itself as it used to do.

In growing grapes in Europe, they use no fertilisers excepting potash made by burning clippings from vine and twigs cut in the pruning of trees, and it was part of my duty, when a boy, to assist in doing this.* In France this is done extensively. It is probably true that a dressing of unleached ashes applied in the spring will make the fruit ripen earlier and attain higher colour and perfection. It may be a lack of potash that causes fruit at midsummer to remain several days without change. This is particularly noticeable in grapes when the vines have set more fruit than they can perfect. In such cases mildew often sets in, and the fruit never matures. Potash aids not only in perfecting the seed, but in that mysterious process which changes the acid astringent green fruit to the wholesome lusciousness that the same fruit attains when ripe. Whatever of sweetness the fruit has, it receives through the leaves, but cannot do so unless there is soluble potash to be taken up by the roots from the soil. The lime in the ashes tends to make the plant food already in the soil available, and is essential to plant growth, also for decomposing vegetable matter in the soil.

With the ashes there is always a certain amount of charcoal; therefore what the ashes are deficient in, the charcoal provides. Charcoal, which is frequently used as a manure, does not act as such by changing into carbonic acid. Its effects are solely owing to the property which it has of retaining large quantities of various gases in its pores. Fresh burnt charcoal will absorb ammonia to ninety times its own volume. It also absorbs hydrochloric acid, sulphuric acid, hydrogen, carbonic acid, oxygen, nitrogen. Ammonia, from its being the great source from which plants derive nitrogen, is one of the most important components of manure, and this ammonia is a colourless gas with a pungent smell, such as we meet with on opening the stable-doors, also when cleaning the manure from the pig-styes. Charcoal forms a valuable auxiliary to all manures, and when applied to the soil alone has great fertilising properties, and it also renders the soil to which it is applied in any considerable quantity lighter and more friable.

In using charcoal, I make a large quantity of strong liquid manure, and into this is put the dry charcoal. When well soaked, it is taken out and dried. It can then be used as required. In repotting plants I simply put a

* We have seen the clippings forked in, in Switzerland, without burning —Ed. Q.A.J.

little of this in the bottoms of the pots, and, as soon as the roots reach it, its effects can be immediately seen. Being in a dry state, there is no smell while using the charcoal. I also use this in a powder to the soil to darken and enrich the flowers of dahlias, petunias, roses, and other flowers, and the foliage of all is improved by the use of this, combined with wood ashes.

I think it would be advisable for everyone to preserve all the ashes they possibly can in a dry condition, and distribute them over the roots of the trees in the orchard and also in the garden. If the soil has been roughly dug, the ashes may be scattered on the surface each day they are collected. It would not be amiss to utilise the ashes in this direction all the year round, since the trees will be benefited thereby. They do their work slowly but surely, and this I have proved by experience.

PERFUME INDUSTRY.

AS AN ADJUNCT TO THE FARM, ORCHARD, OR COTTAGE GARDEN.

IN former issues of the *Journal* we have advocated the cultivation of flowers on the farm with a view to scent-making, and now, through the courtesy of the Department of Agriculture of Victoria, we are enabled to give some account of the Government Perfume Farm at Dunolly, Victoria.

The farm lies about six miles west from Dunolly, in the neighbourhood of Mount Bealiba, and on a soil of decomposed granite. That is, it is about the centre of an area whose mean annual rainfall is 22 inches; whose winter climate is mild; whose summer temperature is up to the average of the hotter districts of the colony, while its soil is loose and friable, being little more than silicious and argillaceous sand, impregnated with the *débris* from the decay of past vegetation. For water supply, to eke out its somewhat scanty rainfall, there is a small dam on the farm. The water distributed from this little storage helps to sustain the plants through the protracted droughts of summer.

It may be mentioned here, once for all, that the employment of hired labour of the ordinary kind, at the ordinary rates current in the colony, is quite out of the question in connection with the growth of scent plants and the preparation of crude perfumes. The work is eminently suited to the capacities and strength of women and children; it is indeed much better adapted for them, and they are much better adapted for it, than are able-bodied men. The combination of light labour with patient manipulation, and a certain degree of skill and keenness of perception, are exactly what they are fitted for. The work itself is no harder than, and probably equally enlists the sympathies with, dairying, tending cattle, feeding and tending pigs; all of which occupations are deemed, both here and elsewhere, to be within the range of the lighter kinds of farm labour. The work would be specially suitable for village settlers and for that class of holders—numerous in some parts of the colony—who supplement the wages they earn from the larger land-owners by the cultivation of small areas on their own account. Thus followed it would be not a primary occupation or a fundamental source of the income of a family, but a sort of secondary occupation, affording profitable outlet for such labour as would be otherwise wasted. To give some idea of the return to be derived from it, it may be stated that were an able-bodied man to devote himself entirely to this work, with such assistance as he could get from his wife and from three children able to lend a helping hand, he could manage from five to ten acres, the net return from which, reckoning the produce at the rates now current in Marseilles, would be not less than £20 per acre per annum. Beyond the cost of the land itself the capital required would be small, as will appear from the sequel.

One difficulty that would almost inevitably confront the perfume cultivator, on his entering on the industry, would be the disposal of his produce when ready for market. This could only be effected by co-operation. A single grower could not possibly obtain the ear of the public; he would be at the mercy of the dealer, and would be compelled to accept almost whatever price the man of ready money might choose to offer. A community of scent-growers, on the other hand, if their goods were up to the recognised standard, could command better terms, might employ an agent of knowledge and address to negotiate their sales, and would even attract the attention of competing buyers for the trade. The farmer gets for his wheat a price so near to that for which flour is sold to the consumer and bread to the householder, that it may be said there is, in general, no more between them than a fair living for the dealer, the miller, and the baker, interest being allowed on their outlay of capital. So it is with respect to malting barley, oats, and other grains, potatoes, wool. So it is with respect to the great staples of the world in general, those products that are consumed by the mass of mankind, some exceptions being, however, made in the case of meat, fish, and other perishable articles. So it is with respect to butter, thanks to the efforts made by the Department of Agriculture, for the proper organisation of that branch of rural industry. Why is it that the case is otherwise with regard to wine, olive oil, &c.? Why is it that it would be otherwise with perfumes? It is that, whilst the trade in leading staples has become organised in response to the continuity and urgency of the demand, and the certainty, comparatively speaking, of the supply, that in products less generally in request is so entirely in the hands of dealers that the producer on the one side, and the public on the other, are practically at their mercy, and prices are hardly affected by the cost of production. The wine trade of the colony, now just entering on the stage of proper organisation, may be taken to illustrate what is meant. Hitherto, amongst the smaller growers, only those have attained any degree of commercial success who have established direct trade relations with the consuming public. Those who have not done so, or whose resources have been insufficient to enable them to keep their wines till matured, have been compelled to part with dry red table wines, of fair strength and quality, in their young state, at from 8d. to 1s. 3d. per gallon; the liquor being sold to the public, from one to three years later, after racking and manipulation, at from 16s. to 24s. per dozen in glass. Those vigneron who have been in a position to keep their wines for a time, and who have succeeded in reaching the ultimate purchasers directly, have, on the other hand, been able to realise from 2s. 6d. to 3s. 6d. per gallon for similar wines, sufficiently matured, in wood, or from 10s. to 14s. per dozen in glass. So, in the absence of organisation, would it be with the perfume business. Unless there be communities of growers, with a total of produce sufficient to be worth the attention of the regular trade, and having relations established with it, the producers would be at the mercy of jobbing dealers, and would receive as their remuneration a mere fraction of the prices paid by the public for their wares. A condition precedent to the successful establishment of this industry is organisation and concerted action.

As we have already explained the methods by which the perfume is extracted from the flowers, there is no necessity for repeating them here. For distillation, the plants recommended by Mr. Mellon, manager of the farm, are:—Rose, lavender, geranium, rosemary, peppermint.

For the manufacture of perfumed spirit:—Tuberose, violet, mignonette, jonquil, wallflower. Cuttings of any kind to the number of 100 will be given free of charge to intending growers; above that number the price at the farm is 40s. per 1,000.

In the preparation of essential oils by the process of distillation there should be no mixing of different kinds, each variety of plant must be treated separately, and the products kept apart. In the other process, if the grower have not enough of one variety to saturate the available fat, he may finish it off

with another, producing what is known in the trade as *mille-fleurs*. This is one of the advantages pertaining to the latter mode. These scents are sold under their own names to the dealers or manufacturing perfumers. The latter blend them, reduce them, mix them with bases suitable as vehicles for presenting them to the public, whom they reach under the other names by which they are familiar to the world at large.

It thus appears that this industry may be entered on by the small land-owner at an expenditure of capital such as would be within the means of almost any farmer or settler. It would demand no technical knowledge, except that within easy reach of any who choose to seek after it; and no degree of skill that could not be acquired by persons of fair intelligence and of ordinary handiness. Its successful establishment will, however, demand co-operation to secure a suitable market and a sufficient price for its products. Will the rural population deem it worth while to add the cultivation of perfume-producing plants to their already established sources of income?

THE LAVENDER PLANT.

The cultivation of perfume plants is extremely simple, but so numerous are the inquiries for information concerning their growth and after treatment, that a brief description of a few of them may be useful to those who contemplate entering into their production and manipulation.

LAVANDULA AUGUSTIFOLIA, OR *VERA*.

This is perhaps the most popular of all perfume plants. Baron von Mueller describes it as the principal lavender plant, and it is the one employed in producing the superior well-known English oil of lavender.

The lavender plant is so well known that it is unnecessary to enter into a lengthy description of it; but, as there are various species, it may be well to mention briefly the merits of each.

The illustration, which is taken from a standard work—kindly supplied by Baron von Mueller—gives the true character of the plant. As compared with *Lavender latifolia* or *Spica*, the foliage is small, and the flowers more distributed on the long slender stems. The habits of this family of plants resemble



each other in most respects; but, as far as value of oil is concerned, the *Vera* is much superior to all others, and should be chosen where it is intended to enter into lavender cultivation.

MODE OF PROPAGATING.

The principal method of propagating is by cuttings or slips. Some maintain that slipping down the small twigs, leaving the heel attached, is preferable, as this gives a better root system, and the plant is more vigorous than that from the clean cut ; but, whatever there may be in this, there can be no doubt that a good well-prepared cutting will hold its own with any other. The cutting should be of clean and fresh growth, about 4 to 5 inches in length; the side leaves should be taken off, leaving only the top one or two which are exposed. These should be planted in sandy mould, properly prepared so as not to crust or bake on the surface. The paring from the surface of a sandy or light loamy soil will answer the purpose well. It should be gathered and placed in heaps some time prior to its being used, so as to decompose the vegetable matter which it contains. The cuttings or slips are then placed in a frame or box, and supplied with a slight bottom heat, where practicable, which will assist considerably in getting the young plants started into a vigorous and healthy growth.

Plants may also be raised from seed, but this system is not so favourably regarded, as the seeds vary in character, owing to the lavender bloom being a special favourite for bees and other honey-seeking insects, which inoculate the flowers from any of the same family that may be within reach; the product then has not that even character which is obtained by the carefully selected cutting.

SOIL.

A sandy loam is most suitable for lavender growth. The plant thrives under almost any conditions, but, when oil extraction is the object, suitable soil and climate should be chosen; if grown on strong or rich land, the produce is coarse.

In some parts of the colony this plant becomes quite a coarse shrub, and useless for producing that fine rich scent which it is noted for. Land altogether too poor for ordinary farming will answer well for many of the perfumes, lavender included.

PREPARATION OF SOIL.

The soil should be ploughed a good depth, 7 to 8 inches, and be exposed to a summer sun prior to receiving the plants. The furrows should be well pulverised to the depth to which it is ploughed, in order that the young plants may be enabled to push their way through in search of food; and, unless they are enabled to get a good firm hold of the soil, they will not be enabled to withstand the summer drought, as the strain on the plants when the tops are removed is considerable, and frequently results in their loss altogether. Every care should be taken to guard against breaks in the plantation, as the young plants are not easy to re-establish between the old growing ones.

DRAINAGE.

This very important operation should not be overlooked, as on it not only does the life and health of the plant depend, but also the quality of the product. A good system of drainage is essential, both to surface and subsoil, and wherever the water is inclined to lodge in the bottom it must be got away or evil effects will soon follow.

Where the subsoil is porous, deep drainage is unnecessary, but surplus surface water should be removed.

SYSTEM OF PLANTING.

The usual system of planting is in rows which are 5 feet apart, and the plants 4 feet in the rows; sometimes the rows are 6 feet apart, and the plants closer in the rows, but the practice varies. It is well to give them an abundance of room; this will enable the cultivation and work of harvesting to be carried on with greater advantage. Some advocate the close planting system, and have

the plants so close together in the rows as to form hedge-like rows. The working is then confined to the two adjoining rows, but this system is not recommended.

The following illustrates the practice adopted by Mr. Hulme, of King River, Wangaratta district, who has entered into lavender cultivation. He has now about two acres planted, and purposes increasing the area to four or five acres. He has planted 3 feet by 4 feet, which appears to be rather close, but Mr. Hulme thinks this distance satisfactory :—



The following illustration gives the method adopted in one of the lavender farms of Mitcham :—



This is planted 6 feet by 4 feet, which is the usual distance in the later plantations. There are several small lavender plots throughout the colony which appear to thrive well, but the method of treatment differs somewhat in

each, which goes to prove that, so far as the growth of the plant is concerned, no hard-and-fast rule need be laid down, as the plant will adapt itself to a variety of conditions. The young plants, taken from the nursery in which they have been struck the previous season, may be planted out in their permanent places the following spring, and every care should be taken that the young roots are not mutilated more than is necessary. The evil of close setting in the nursery bed will now be seen, as the plants will have matted together and become damaged in the separating, which will affect the young plant in its start and render it less productive in its after life.

There are different methods of setting out or rather marking out the position of each plant; one is by means of marked wire lines stretched across the rows or along them, each mark giving the plant its place. This practice is generally adopted in planting vines, and differs but little from that of setting out lavender plants. Straight parallel lines will materially assist in the after working, and a little care in this respect will be well repaid.

In planting out the young sets, care should be taken to remove all damaged roots. A clean cut should be made where there is a breakage to prevent rot setting in and affecting the constitution of the young plant.

DISEASES.

The greatest enemy that the lavender plant has to contend against is fungoid growths. These are but little understood, but their effect is nevertheless frequently felt.

The plant is one that can withstand considerable hardship. According to Baron von Mueller, it grows in Norway to latitude 59 degrees 55 minutes, and with slight shade may be grown in the tropical climates, but when placed in unsuitable positions, or, like most other plant life, when subject to adverse atmospheric conditions, it becomes a prey to parasitic fungoid growths and succumbs. The only remedy recommended is cleanliness, which means cultivation and proper attention to sanitary arrangements in the matter of drainage. No doubt the application of ordinary fungicides would assist in checking the spread of this pest, but so little is known of it that no reliable information can be given; but, as the germs of insect and fungoid pests may be taken to the permanent plantation on the young plants which may have been affected whilst attached to the parent, or raised on a nursery bed within reach of other affected plants, every care should be taken in selecting the cuttings, and none but those from healthy plants obtained and placed in virgin soil as previously advised.

AFTER CULTIVATION.

In no crop is it more necessary to properly cultivate the soil and keep weeds in check than in a perfume crop. Any foreign matter mixed up with the product has a deteriorating influence on the oil produced; and, further, the plants being cut back when in full flush of growth, require all the assistance they can get to overcome the check, and in no other way can this be accomplished than by thorough cultivation. Where there is any extent to cultivate, it is necessary to be in a position to employ the most economic methods of performing the work, and, by planting as described, horse-power may be brought into use and the labour performed at a minimum cost. The plant being constantly cut back becomes spreading in its habit and occupies considerable room; therefore a liberal allowance of space between the rows will be requisite in working, &c.

HARVESTING.

The time of harvesting is when the plant is in full bloom; the essential oil is obtained from the flower and stem, and the greater amount of blossoms the better will the produce be.



The mode of harvesting is as represented in the accompanying illustration. The plant usually reaches from 2 feet to 2 feet 6 inches in height, and is cut back with a sickle to within 6 inches or 8 inches of the ground. The material is laid down on strong cloths, with the top part of the plant pointing inwards from each end of the wrapper. The edges of the cloth are then skewered together, and the product carted to the still; the weight of each running about 100 lb. to 120 lb.

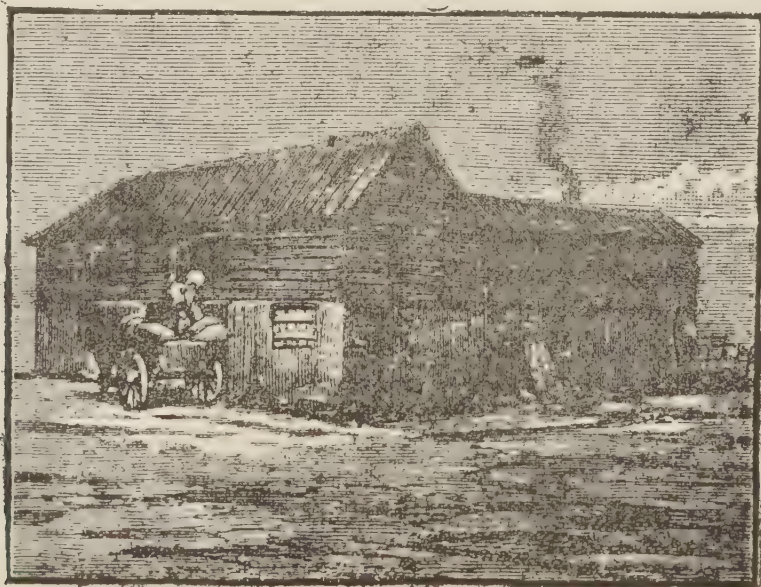
METHODS OF EXTRACTING THE PERFUMES.

This subject is one that requires carefully describing to be of any use, and can be best done when treating the various kinds of plants; but as the lavender plant only is now under notice, the system usually adopted with it, which is distillation, will be explained.

Space will not permit of attention being given to all the various classes of stills employed in the extraction of perfumes; but some of those which are in use throughout the colony are of the most primitive kind, others are equal to any found elsewhere.

Illustrations of those in use at Mitcham are given herein, and also the practice adopted there, as by far the highest price is obtained for the product of this well-known scent-producing district.

The following illustration gives a view of the general character of the building, which, it must be admitted, is in no way pretentious. It merely consists of a two-story building or shed, the upper floor being on a level with



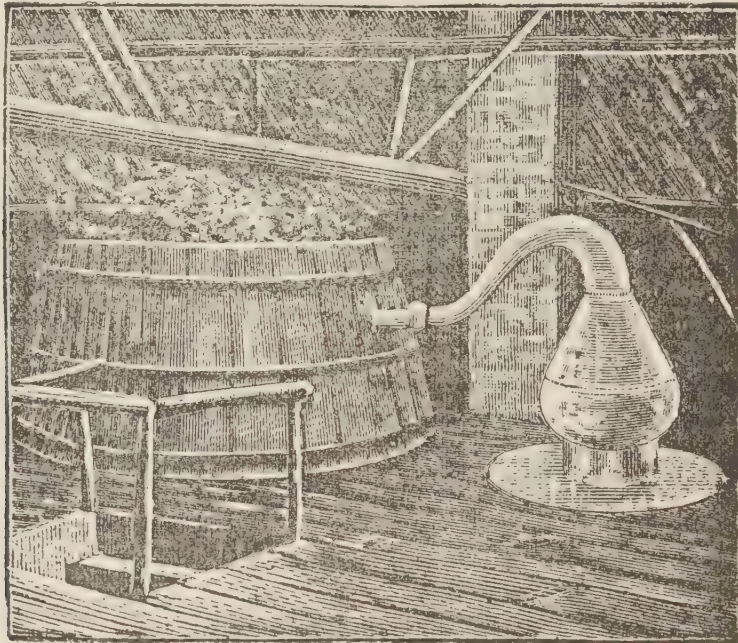
the mouth of the still, the furnace and body occupying the ground floor. This is found to be the most convenient system for work. The product is taken from the field in the manner shown in illustration taken by the special correspondent of the *Chemist and Druggist* when passing through the field at Mitcham—the owner being a French gentleman, named M. Lelasseur, who has entered into the cultivation of perfume plants there. His system is somewhat in advance of that practised by the old residents, and which has been handed down from generation to generation.



As will be noticed, the style of vehicle is somewhat un-English in appearance, but is specially adapted to the work it is intended for, and may well be copied by those entering into the perfume industry. On this “foreigner’s” place (as he is termed there) great care is exercised in the treatment of the product. It is carefully housed in sheds after cutting, and removed as required.

The use of the cloths or mats, previously referred to in describing the harvesting, will now be recognised, as loss is completely avoided, the butt portion of the cut plant only being exposed. The mats are delivered through a door to the upper story, as shown in the previous illustration.

The interior of the distillery is so arranged as to facilitate the carrying out of the various operations with the minimum amount of labour. The following illustration shows the still at work:—



The large vat contains the condensing worm, which passes through to the ground floor, delivering the oil there in suitable vessels. The still head, which is shown to the right, is removable, and on a level with the upper floor, and through this opening it is charged and discharged.

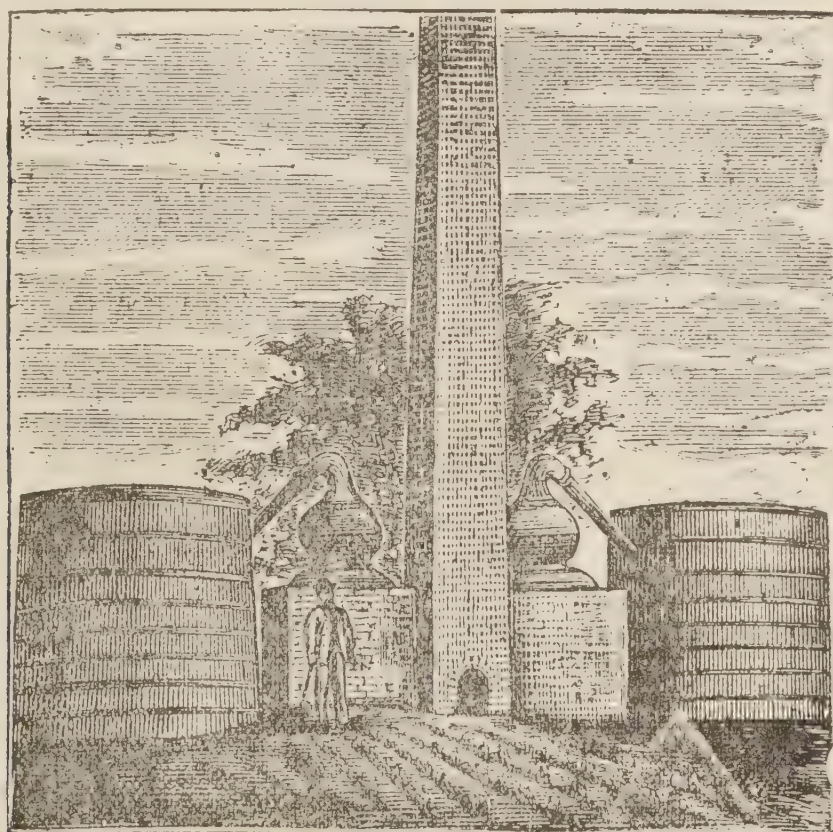
The following illustration shows the method of removing the exhausted material from the body of the still:—



The head being removed from the still, two men proceed to extract from the boiler the exhausted material, and for this purpose a huge six-pronged

fork is employed. To it is attached a chain which is passed through a pulley in the beam above, the other end being taken to a windlass, and at a given signal the fork is let down into the body of the still or boiler. When properly adjusted or loaded, it is hoisted up and passed on through to the door and thrown down to the yard below. The contents of these stills are stated to be about 20 to 25 cwt. of the raw product, and the time occupied in extracting the oil from four to five hours. Many of the stills at Mitcham are held by individuals who let them out to the small growers at so much per charge, and during the seasons they are worked night and day. It is so arranged that the oil delivery is under lock and key, no one having access to it but the person whose produce is under treatment. This system works satisfactorily, and should be well adapted to our small communities, such as village settlements, where the one expense could serve for all. The cost of such distillery plants should not be much; any building would answer the purpose, and to many of those whose settlements are situated on inferior soils, it is only by such products as these that they can hope to compete with their more fortunate neighbours.

The following illustration gives the latest design of still which has been erected for the treatment of perfume plants generally, and when not employed by the owners are hired out, the cost being about 20s. to 30s. per charge, and the capacity from 1,200 to 1,500 gallons:—



The stills are used for various purposes; but, as previously stated, the cultivation is now confined chiefly to lavender, mint, and a limited area of camomile; the variety of lavender chosen being that of *L. Vera*, which is found to give the best results. There are many varieties of lavender, the only ones which receive any attention worthy of note for perfume are those known

as *L. Vera* and *L. Spica*. The treatment of each is similar, but their value in oil production differs. The following is the illustration of *Lavandula latifolia* or *L. Spica* :—



The oil of this is of much less value, but the plant gives a much heavier yield, and is said to be hardier and have a more vigorous growth. It is found growing in all parts of the colony, and is more general as a garden shrub or plant than the *Vera*. The same treatment is required for this as for the other variety.

LAVANDULA STÆCHAS, OR TOPPED LAVENDER.

This is frequently met with in the colony, but is not much used for oil extraction, as the oil is of an inferior quality, partaking more of the rosemary.

Baron von Mueller states that it grows readily from seed, and in mild districts it is for five months in full flower, and comes early in to bloom.

RETURNS PER ACRE.

The returns per acre from a lavender crop, as may be supposed, vary considerably, and the price fluctuates in proportion to the yield. The quantity of oil is not regulated by the amount of material obtained from the plant, as in some seasons the return of oil per still charge varies up to 30 per cent. An instance is given in 1890, when 34 stills gave 240 lb. 10 oz. of oil of mint, when the following season the same number produced 170 lb. only.

The late Mr. Slater, of Mitcham, Victoria, was a recognised authority on the cultivation of scent and drug plants. This gentleman stated, before the Vegetable Products Commission, that an acre of lavender plants will yield from 3 to 5 tons—three from young plants, and five from old. The yield of oil is stated to be 14 lb. per ton; from this it will be seen that 42 lb. of oil are obtained per acre. These figures are, however, disputed; but there is evidently a good margin of profit when lavender oil can be produced of a suitable quality.

The value of the oil varies from 7s. to 10s. per lb., and, if the yield is considerably less than that stated, there should still be a handsome profit for those who have labour and means to enter into this industry. Judgment is required in the selection of suitable sites for this and other similar products, and also in the manipulation of the plants.

For more advanced information on the chemical aspect of the business the standard works may be consulted.

Tropical Industries.

THE BREADFRUIT.

ARTOCARPUS INCISA (TRUE BREADFRUIT).

By E. COWLEY,

Manager, Kamerunga State Nursery, Cairns

THIS tree was introduced from Fiji to Kamerunga State Nursery in the year 1892. A specimen of the first fruit was sent to the Queensland International Exhibition during last year, preserved in methylated spirits. The breadfruit has been known in North Queensland for some years. A tree is growing at Balaclava, on the Mulgrave road, which, from its size, is probably twelve or fifteen years old, perhaps more. From what was noted, I should deem it a sparse fruiting sort. It may be it is rather far from salt (sea) water, in which case it can hardly be expected to be prolific of fruit, as the breadfruit is a native of the South Sea Islands, and cannot be expected to thrive *very far* from the ocean. A rather fine specimen was observed by the writer in the Townsville Botanic Gardens about two years ago. This seemed to be bearing fruit in considerable numbers, and had altogether a healthy appearance. It is probably not so old a tree as the Balaclava specimen, but it is in a much more favourable locality, the Townsville Botanic Gardens being in a spot similar to the site of the Cairns Esplanade—*i.e.*, somewhat fronting the sea. This tree evidently feels more at home where it can breathe the salt sea air. Mr. Montgomery, of Port Douglas, reports a tree growing near that port, from which he has taken fruit and eaten it after cooking, and he very kindly sent me some root cuttings from this plant. It has been reported that it is also growing at or near Geraldton; but as my informant could not tell if the tree he saw was *Artocarpus incisa* or *Artocarpus integrifolia*, it is a matter of doubt. The true breadfruit is found in its wild or uncultivated state mostly in the South Sea Islands. The quality of the fruit seems to decline as it nears the Equator, and it seems to do best in about our own latitude, Cairns—so much so, that the missionaries of New Guinea have introduced from Fiji plants of the indigenous variety growing in those fertile islands. It certainly somewhat surprised the writer to find no good breadfruit was to be had in that possession when he was there a few years ago. The breadfruit-tree was also noticed in Java, between Batavia and Buitenzorg, but the fruit was not tasted. It is probable this has been introduced into Java, as it has been into most tropical countries, from the Pacific Islands. In our school days we used to read with very considerable satisfaction about Bligh and his two voyages from England to the South Seas.

There is a captivating spirit of romance in the tale of the mutiny of the "Bounty" (Bligh's ship), which sailed, commissioned by the British Government, on a mission to the South Sea Islands to collect plants of this tree and transport them to the West Indies. The first voyage was made in 1787, but a fatal mutiny of the crew at that time prevented the accomplishment of the design. The commander of the vessel, however, returned in safety to his country, and a second expedition, under the same person and for the same purpose, was fitted out in the year 1791. After an absence from England of about eighteen months, he landed in Jamaica with 350 breadfruit-trees in a living state, having left many others at different places in his passage thither. The breadfruit does not seem to have been much esteemed by the

negroes (then slaves), they having a long-established predilection for the plantain, so that altogether Bligh's botanical expedition cannot be considered as highly satisfactory. We are told in Captain Cook's first voyage round the world that the edible part of the fruit lies between the skin and the core, and that it is as white as snow, and somewhat of the appearance of new bread.

Allowing for a little exaggeration in Captain Cook's statement, it is a very useful vegetable, and may be cooked in a variety of ways. Some prefer it fried in slices, as one would fry bread; but the natives of the islands usually roast it in the fire, turning it round as it bakes, and occasionally scraping the surface, removing the accumulating cinders thereon, and, when quite cooked, it is broken into portions and divided among the onlookers, and the core is discarded. There is no seed in the core, and the propagation of the tree is done by root cuttings. Shoots from the roots are observed beneath the older trees. The root is severed from the source, and the plant then removed as required. A safer plan is not to cut the root completely through in the first instance, but leave a little substance to connect with the parent tree, which, after a time, when the young plant is wanted, may be removed, as the scion by that time will have commenced to root on its own account. It has always been a puzzle to me to ascertain how Bligh got his plants; it seems he must have secured 300 or 400 at least. Perhaps, at Tahiti, supplies of plants were obtainable more readily than at the present time from some of the other South Sea Islands. Not only is the breadfruit valuable as a fruit-bearing tree, but from the exuding gum a material is prepared by the Fijians, and probably by other South Sea tribes, with which they caulk their canoes. This, after preparation, is of a dark colour like our own pitch. The inner layer of the bark of the tree is covered with a fibrous coating, which is beaten into a sheet and forms a "tappa," or native dress. This has rather a neat appearance, and is appreciated by the natives for its coolness. It is sometimes dyed, and fantastic patterns formed in different colours on its surface. The Fijian natives call them "sooloos." The fact that the breadfruit has, at this nursery, borne fruit during 1897, and is still bearing, makes it apparent that five years is necessary for this desideratum.

This and other matters of a like character is what our State Nursery was designed to establish. Johnson says, in his *Gardeners' Dictionary*, 1886, speaking of *Artocarpus*:—"In this order we meet with such anomalies as the invaluable breadfruit of the tropics, the useful cow-tree of the Caraccas, and the virulent poison of the Upas-tree of Java, side by side." He further says that the best method of propagating the tree is to place cuttings of ripened wood in sand, and in a brisk, sweet, bottom heat, loamy soil, and that "the flowers of all the species are whitish green." To those of our fellow-colonists who live in the Southern portion of Queensland it may be as well to advise that the tree requires a high and very moist atmosphere, a copious supply of water, perfect drainage, and a sandy compost of rich loam and leaf mould. Mr. Nicholson, A.L.S., Curator of the Kew Royal Botanic Gardens, says:—"Under all conditions this genus is difficult to propagate. The young and slender lateral growths are adapted for cuttings, and suckers may be utilised when procurable, which is rare." In all probability Mr. Nicholson is correct. Of course we have a great advantage living in the tropics, but others have found the difficulty of propagating the young plants. The Curator of the Townsville Botanic Gardens had recently a quantity of young plants, but did not say how he reared them. It is likely that the variety growing at the Townsville Gardens is a good one, but from what part of the South Seas it was obtained is not known by the writer. A. R. Wallace, in his excellent work, "The Malay Archipelago," says, speaking of the breadfruit:—"With meat and gravy it is superior to anything I know—either in temperate or tropical countries; with sugar, milk, butter, or treacle, it makes a delicious pudding, having a very slight and delicate but characteristic flavour, which, like that of good bread and potatoes, one never gets tired of." I do not agree with Mr. Wallace in this or in some other statements he has made regarding

Plate XIV.



ARTOCARPUS INCISA. BREADFRUIT.

the fruits of the Malay Archipelago. Breadfruit is very nice, even very good indeed, particularly to a half-famished European who may chance on some just cooked after a long pull or sail in a boat, but it bears no comparison to the potato or green peas with gravy furnishings. This same Mr. Wallace, in the same book, tells us that the durian is the "emperor of fruits," and calls the mangosteen the "king of fruits." Certainly tastes differ, and with the taste opinions, but how so excellent a writer as Wallace could think of giving such a high place to "durian" passes my comprehension. We have to deal, however, with what he says regarding the *Artocarpus incisa* fruit.

According to Von Mueller, who gives R. and J. Foster's name to this tree—viz., *Artocarpus communis* and *Artocarpus incisa* (Linn. fl.): "It stretches in the Sandwich Islands through cultivation almost beyond the tropics, ripening fruit also in Florida." According to Dr. Seeman's excellent account, seeding varieties exist, and others with entire leaves and with smooth and variously shaped and sized fruits; some ripening earlier, others later, so that ripe breadfruit is obtainable more or less abundantly throughout the year. The fruit is simply boiled or baked, or converted into more complicated kinds of food. Starch in quantity is obtainable from the breadfruit. The very fibrous bark can be beaten into a sort of rough cloth. The light wood serves for canoes; the exudation issuing from cuts made into the stem is in use for closing the seams of canoes, and could be turned to technic account. Messrs. J. P. Williams and Brothers, of Henaratgoda, Ceylon, offer to supply plants of *Artocarpus incisa* by the wardian case of fifty plants for the sum of £10, so it would seem that the breadfruit has found its way to the west of us, and is being turned into capital. One cannot help comparing what it must have cost the British Government to send Bligh twice to the South Sea Islands and back to the West Indies, 100 years ago—probably returning with not more than 500 plants after an absence of years—with the facilities of the present day, when we are able to send a telegram to Ceylon and have the same description of plants packed in fine wardian cases and shipped by steamer to arrive in a few weeks, and all to cost probably one-hundredth part of the sum spent in the "Bounty" affair.

The breadfruit-tree, requires some shelter, as its wood is soft and milky. In a sheltered spot it forms a most delightful object, and never fails to attract attention of the temperate zone visitor, particularly when its large fruits (which are terminals on long peduncles) are in evidence. The recent gale experienced at Kamerunga destroyed most of the trees, and caused most of the fruit to fall. The fruit of its congener, *Artocarpus integrifolia*, differs as it evolves from the main stem, and so is in a measure protected by its branches. Most of the leaves of *A. incisa* fall at the commencement of summer; but it has not been noted entirely deciduous. It should be deemed a tender tree, and suitable protection provided for it. With us, it will scarcely ever become an article of considerable abundance, but the careful housewife of the Northern farmer, when she gets to know its value as a vegetable, will not let her husband rest until she has at least half-a-dozen trees in some sheltered nook; not only will a most delightful shade be thus established, but an excellent vegetable will be secured, which will always be welcome on the dining-tables of the rich and poor.

COFFEE-LEAF DISEASE.

By PHILIP MAC MAHON,
Curator, Botanic Gardens.

THE Ceylon coffee-leaf disease is a plant growing upon a plant. The first botanist who noticed it and reported upon it was Dr. Thwaites, the Curator of the Government Botanic Gardens in Ceylon. He soon saw that he had found a fungus which he had never previously seen, and he sent specimens to his

friend, the eminent botanist, Rev. M. J. Berkeley, who described and figured it in the *Gardeners' Chronicle*, 6th November, 1869, giving it the name *Hemileia vastatrix*. Its most noticeable feature to the unaided eye consisted of circular blotches like ironmould on the under surface of the leaves, and from this fact the natives of Kandy soon gave it the name of "Yakada rogaya" (iron disease).

It spread with fearful rapidity. Without doubt, the coffee plantations of the island were in a condition to harbour the guest so unwelcome to the planters.

In 1866-7-8 the average yield of coffee in Ceylon was 4.28 cwt. per acre; in 1872-3-4 it had fallen to 2.93 cwt. per acre; and in 1878 the average was below 2 cwt. per acre.

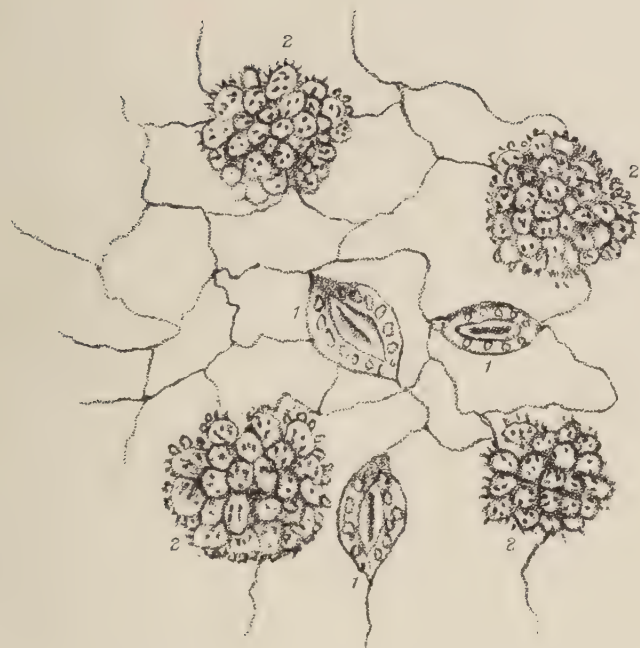
Let us look at the tiny plant capable of working such mischief, and so fix it in our minds that if ever by evil chance the coffee-grower shall find it in his plantations, he may be able to recognise it with some degree of certainty.

The figure in the top right-hand corner of the illustration shows what the entire plant is like when magnified 200 diameters. We shall see presently how you can detect it without a microscope. Every person who has to do with plants should carry a good lens. He will find that it will open up to him quite new ideas on the subjects of the insect and fungoid pests by which he is, and will ever be, surrounded. One of the gardeners in these Gardens, who had worked all his life amongst plants, was shown the other day the eggs of scale insects through a strong glass. He was astounded, and went about his work with a far clearer idea of the task before him than any amount of reading would have conveyed.

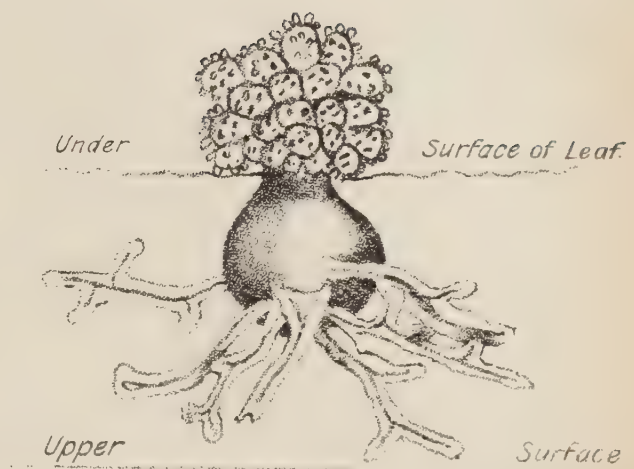
The Rev. R. Abbey, an enthusiastic botanist, studied the *Hemileia* plant in 1877; and in 1878 the present chief of the Royal Botanic Gardens at Kew, Mr. W. T. Thistleton Dyer, M.A., F.L.S., communicated to the Linnean Society of London a clever paper on the subject by Mr. Abbey. This gentleman succeeded in growing the spores of the tiny fungus in England, though they had been sent from Sumatra to Ceylon, and from thence to England in the dead of winter. This will give an idea of the tenacity of life of the seeds—or, to be technical, the spores—of this fungus, which botanically belongs to the same general family as the ordinary mushroom. If you look again at the figure in the top right-hand top corner, you will see that the tiny plant bears a rather close resemblance to an ordinary puff-ball fungus, such as you have often found in the paddocks.

Now you know, or if you do not it is as well to learn, that almost every leaf has dotted over its surface an immense number of breathing-pores, called stomates or "little mouths." These are the doors of communication between the leaf-cells and the outer air. It is as essential to the plant that these stomates should be free as it is to you that your lungs and mouth should be in good working order.

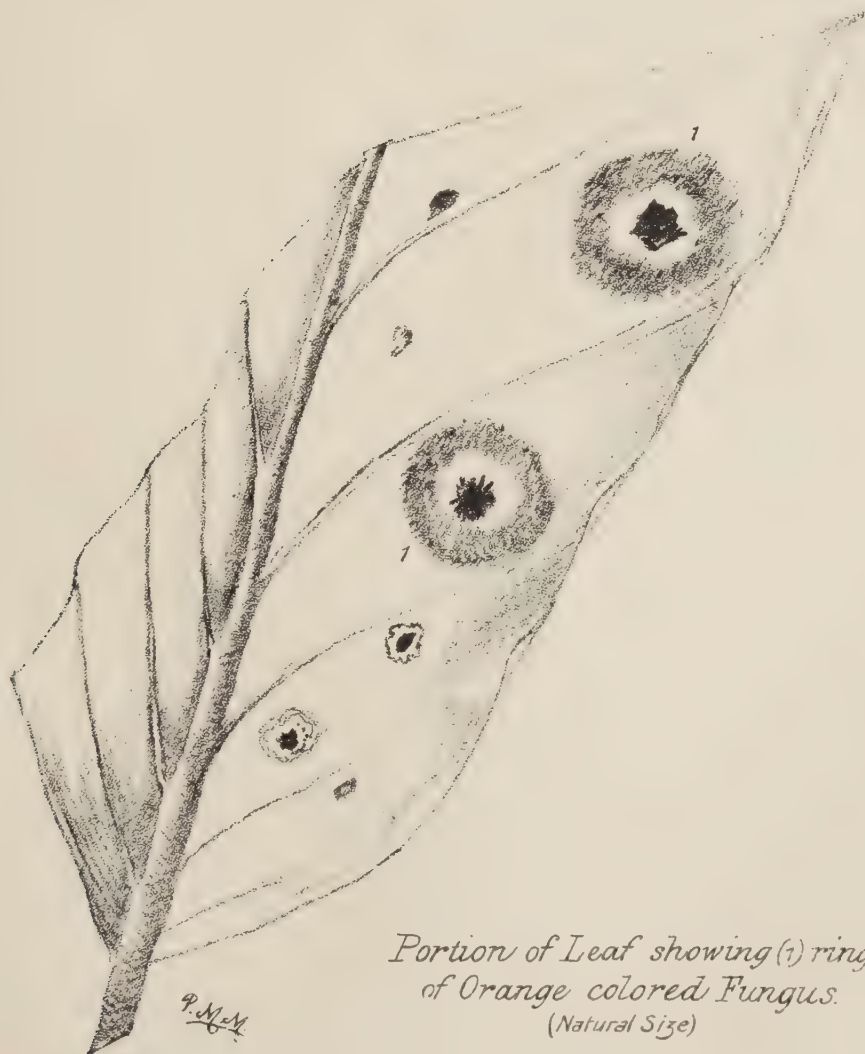
These stomates (the English terminations are used in order to avoid confusion, for it is assumed that you have been too busy to read up this subject) vary in their condition according as they are acted upon by external influences, as well as by influences connected with the growth of the plant. The seed (spore) of the tiny fungus falls on a leaf, and attacks the leaf through the breathing-pore, grows through it in fact, and soon assumes the appearance shown in the sketch, where the mycelium (as the thread-like bodies, corresponding in some degree to the roots of other plants, are called) are shown shooting from the base of the flask-shaped body which forms the main body of the fungus. On the top you will note a spreading tuft. This is the cluster of sporanges, or spore-cases, which grow outside the lower surface of the leaf, the narrow neck of the flask-shaped fungus passing through the breathing-pore. All the rest of the fungus is embedded in the substance of the leaf between the upper and lower skin, and myriads of breathing-pores are closed up. If you remember how sickly your pot plants become when you allow the breathing-pores to become choked with dust, you will realise how injurious to the growth of the host plant this closing of the breathing-pores



*Under side of Leaf showing (1) Stomates
(2) Clusters of Spores.
(Magnified 150 diameters)*



*Fungus growing in Stomate
(Magnified 200 diameters)*



*Portion of Leaf showing (1) rings
of Orange colored Fungus.
(Natural Size)*

Coffee Leaf Disease

Hemileia vastatrix, After Rev. P. Abbey.

must be. If the pores of your own skin were closed, you could not live twenty-four hours. The breathing-pores which are closed are always, as has been said, on the lower side of the coffee leaf; and when the tiny bunches of spore-cases are first pushed through the pore, there is noticeable a pale spot easily discernible against the light. This spreads like those rings of green grass which you see in the paddocks, called fairy rings in the old country. The two cases are exactly parallel. They are due to the growth of the spores of a fungus in each case. Now the little spot on the back of the coffee leaf gets yellow, and finally, as it grows larger, becomes a reddish-orange. The central spot becomes dark, because careful Nature, who wastes nothing, chooses that spot as the growing place of an *Aspergillus*, one of the forms assumed by a genus of fungi called *Erysiphe*. This characteristic appearance is shown upon a portion of the leaf at the bottom of the illustration, and the tufts of sporanges are shown growing through the breathing-pores in the top left-hand corner. The spores which are borne in those clusters of spore-cases are small. You can place twenty millions of them side by side on a penny postage stamp with room to spare. Fern spores were thought so small as to convey the idea of invisibility, but they are large compared to these. A practical Ceylon planter says of them: "A sucker growing from an old coffee stump can produce germs enough to inoculate a continent." In Ceylon and other countries they are spread by the wind, by birds, by the fur of animals, and by the clothes, skin, and hair of man.

Quite recently a gentleman from Southern India and Ceylon was examining our plantations. He was fresh from *Hemileia*-infested districts. We have seen that the spores can be sent in a letter, and will germinate after having been half round the world. Is there any guarantee that there were no spores attached to the clothes, &c., of the gentleman referred to, and left amongst our coffee. The spores are an impalpable dust, liable to be carried in any merchandise—such, for instance, as the coffee imported for our breakfast tables in such quantity. It may be well not to dwell in too deep a sense of security in quarantine regulations, but to be wideawake for any sign of this pestiferous little plant; and to so order things that it will find it difficult to obtain a foothold even if the spores do come.

Coffee was grown in Ceylon for about 200 years, and on an extensive scale for forty years, before the coffee-leaf disease was heard of. Then it seemed to drop, as it were, from the clouds. About 1,000 species of Ceylon fungi had been examined by Berkeley and Broome, but this fungus was found on no other tree, and never before it was sent by Dr. Thwaites. Yet it must have existed. Thwaites believed it to be indigenous to Ceylon.

We have about ninety plants of the same natural family as the coffee growing wild in Queensland. Have they no parasitic fungi biding their time until the coffee is in a fit condition to become their hosts? Some of the best writers on tropical products have said that good cultivation is the most potent factor in disease resistance. The sickly plant is ever the prey to parasites.

It often happens that plants introduced to a new country make astounding growth for a time, far beyond anything they had exhibited in their native countries (or the countries in which they were last commonly found). Witness many of our weeds. But after a time matters readjust themselves. The soil becomes exhausted of the constituent required by a particular plant, or some other change takes place. Then comes the chance of the parasite, and either some native fungus, deprived perhaps of its proper sphere of action by the clearing necessary to make room for the newcomer, or some imported fungus, takes hold of the enervated plant and works havoc.

The coffee-leaf disease is not now nearly so dreaded in Ceylon as it formerly was; but this is due not to applications of fungicides, which on such a scale would be out of the question, but to improved cultivation and to the fact that the fungus in its turn does not now find the same growth conditions that it formerly did. Last year a large Ceylon estate "topped the record" for coffee yield—*vide Tropical Agriculturist*, Colombo, February, 1878, page 524.

Formerly it was not the custom to manure coffee; it did quite well without it. But for years the crop, a highly special one, was being taken off the land, and no equivalent returned. Wherever this practice is adopted, the end will inevitably be failure of the land to produce that crop, and a condition of the plant favourable to the reception of the first wandering fungus spore of a suitable species which floats that way. Manuring is now largely practised in Ceylon, and the custom is increasing.

The planter should, therefore, keep his plants in good heart by judicious pruning, manuring, and cultivating; should allow no decaying prunings to lie about his plantation; should suffer no weeds, to become intermediate hosts for the fungoid enemies of his trees. He should endeavour to distinguish between grossness of growth and genuine health.

When a pestilence invades a city or a State, do the authorities merely cut off any immediate chance of fresh infection from without, and cure those who are stricken within? No! they do these things, it is true; but they take good care, if they are wise, to improve the sanitary conditions of their cities and surroundings—to improve the general health of the people, so that when the seeds of pestilence come they may have no suitable soil to grow in. And it is so with plants.

The planter should very frequently examine his coffee-trees, particularly the undersides of the leaves. If he gets a good lens or a small pocket microscope, he will find that he has almost discovered a new world. If he have boys or girls, he will encourage them to bring in for examination any leaves having suspicious colourations. By studying the illustration given of the peculiar disposition of the orange-red fungus spore-cases on the back of the leaf, he will be able to make a good guess at the coffee-leaf disease. Should he find any such colouration, he should at once send the leaf to the Under Secretary for Agriculture, when it will be subjected to scientific examination.

Other fungi have been mistaken by experienced planters for *Hemileia*. One such, writing from Chiapas, in Mexico, says:—

“The coffee-trees seemed to have lost their great and exuberant vigour. Their luxuriant foliage was decidedly lessened, and in their stead an unhealthy sickly appearance had taken its place. The leaves were more scattered on the ground than on their proper places on the trees, &c. It is needless to say I soon found out what the cause was. I noticed what to me was an old and familiar face. The under part of the leaf I noticed was semi-perforated. They were spotted all over with the same marks. No wonder that I was frightened. I thought I had discovered *Hemileia vastatrix* beyond all doubt.”

He sent the leaves very carefully to the Smithsonian Institution of Sciences, one of the greatest scientific institutions in the world, and received the following most important and interesting reply:—

“Smithsonian Institution, United States National Museum, Washington. 22nd May, 1894. To Mr. W. J. Forsyth, Chiapas, Mexico. Dear Sir,—The coffee leaves recently transmitted by you for examination have been referred to the Curator of Botany in the National Museum. He has submitted them to Mr. Ellis, of Newfield, New Jersey, who states that the disease which has affected the trees is not caused by the fungus *Hemileia vastatrix*, but by the growth to which the name *Stilbum flavidum* (Cooke) has been given. This, I am told, is quite widespread. Mr. Ellis has in his collection specimens of the same fungoid growth from Costa Rica, Jamaica, and Venezuela. Inasmuch as no experiments have been made in this direction, no remedies can be suggested. Yours respectfully, G. BROWNE GOODE, Assistant Secretary. (2683.)”

Here we have another coffee-leaf disease, said, on good authority, to be doing much damage in South America, and which even an experienced planter, who knew *Hemileia*, mistook for that fungus. It has well been said that in

scientific pursuits you should "make caution your elder brother"; and we are told, on high authority, that "the wise man sayeth, 'Peradventure it may be so, but I prythee inquire'!" The outlying regions of the great Empire of the Infinitely Little have been only casually explored. There is more to be learnt about it than will be learnt in many generations, and every little helps to a fuller and deeper knowledge.

THE DIVI-DIVI TREE (*CÆSALPINIA CORIARIA*).

IN November of last year the Department of Agriculture forwarded to the Acting Agent-General, Mr. C. S. Dicken, in London, four and a-half bags of Divi-divi for report as to its value for tanning purposes. In volume 1, part 2, of this *Journal*, we published a very interesting article on the Divi-divi tree and its products by Mr. E. Cowley, manager of the Kamerunga State Nursery at Cairns. We refer our readers to this article for full information on the subject. The tree yields curled pods, containing generally one seed, and it is somewhat difficult to dislodge the seed from its covering, which is hard and somewhat fibrous. The Divi-divi affords an excellent tanning material, which is worth as much as £10 10s. per ton in the London market. The tree begins to bear in its fifth or sixth year, and in Ceylon a net profit of 18s. per ton has been derived from twenty-five year old trees. Baron von Mueller stated that each tree, when mature, will yield 100 lb. of pods, and as 108 trees may be planted to the acre the produce would thus amount to about 4½ tons per acre. At £9 per ton, this would give the planter nearly £43 per acre; and as the plant is hardy and soon asserts itself, the expense of cultivation is small. It thrives in neglected, worn-out lands, and on those where nut-grass renders cultivation out of the question. The difficulty of removing the seed from the pod will probably account for the remark in Messrs. Fisher, King, and Co.'s report on the sample forwarded.

When forwarding the following reports, Mr. Dicken stated that from them he gathered that the sample sent was of excellent quality, and compared favourably with that received from India and elsewhere. Sir F. A. Abel, Honorary Secretary and Director of the Imperial Institute, London, says in his letter accompanying the report of the Director of the Scientific Department of the Institute: "From the contents of this report you will gather that the sample in question ranks very high in quality with other tanning materials and with samples of Divi-divi supplied from India. There can be little doubt that supplies, equal in quality to the sample received, would realise in the London market at any rate the maximum price hitherto paid for this description of tanning material." The following is the report from the Director of the Scientific Department of the Imperial Institute:—

IMPERIAL INSTITUTE.

REPORT BY THE DIRECTOR OF THE SCIENTIFIC DEPARTMENT ON
Divi-divi Pods (*Casalpinia coriaria*), received from Queensland through the Acting Agent-General, 10th January, 1898.

The analysis of this sample of Divi-divi has furnished the following results:—

	Per cent.
Total soluble constituents	57.50
Non-tanning matters	14.28
Tanning matter (absorbed by hide powder)	43.22
Ditto (calculated on material dried at 105° C.)	51.41
Moisture (at 105° C.)	15.94
Ash	2.22

Divi-divi usually contains from 30 to 50 per cent. of tanning matters, whilst samples of the same product derived from India have furnished percentages of tanning matter varying between 12 and 25 per cent. It therefore appears that this Queensland sample is of excellent quality, and, since the colour is no greater than the average, it should prove a valuable material. I may add that the present market value of Divi-divi varies between £7 and £10 a ton.

WYNDHAM R. DUNSTAN,

Director of the Scientific Department.

25th January, 1898.

A further report was forwarded on 25th January, 1898, by the Acting Agent-General to the Under Secretary for Agriculture, from Messrs. Fisher, King, and Co., London, which reads as follows:—

70-2 Weston street, Bermondsey,

London, S.E., 24th January, 1898.

DEAR SIR,—We duly received your favour of 10th January, and subsequently the sample of Divi-divi. This sample we find to be mixed in quality, part good, part shelly pods, somewhat resembling Savanilla. It is a very fair growth. Shipments should be as free from shelly pods as possible, and the lighter in colour the better. The value of the sample is approximately £9 per ton in bags ex warehouse. If the quality were better—*i.e.*, not shelly—it would probably sell more freely, and realise from £10 to £10 10s. per ton.

We are not quite sure if you are proposing to import this product, but a shipment would probably find a fairly ready market. Should you require any further information, we shall be very pleased to do our best to afford you answers to any inquiries you may make.

Yours faithfully,

FISHER, KING, AND CO.

Charles S. Dicken, Esq., 1 Victoria street, S.W.

A sample of the seeds has been placed in the Queensland section of the Imperial Institute, where it will prove an interesting exhibit. We would, in view of the favourable report on the Divi-divi seed, strongly advise planters and farmers to devote some of their waste land to the cultivation of a tree which in a comparatively short time will yield a handsome addition to the yearly income. A plantation of a couple of hundred trees would form a nice legacy to a man's children, even if he did not live to benefit by it himself.

The following report was also received by the Acting Agent-General from Messrs. T. J. and T. Powell, London Bridge:—We have carefully enclosed the sample of Divi-divi which you sent us, and we consider on the whole that it is a fair sample of this article. A good many of the pods have been burnt up in the drying. Some of them have also been slightly damp, and this has probably set up some heating action which has destroyed the colour and doubtless a great deal of the tanning strength. In quantity, Divi-divi equal to the sample you have sent us would be worth here about £7 to £8 a ton to-day; but if it was properly selected, equal to the sample we are returning to you, which we have sorted out from a portion of the large bag you have sent us, to-day's value would be nearer £10 to £11 per ton. It would be much easier to sell such good quality, the commoner sorts having lately been almost unsaleable on this market. We think it would be possible to sell large quantities, especially if the quality is kept up. If we can give you any further information about this, we shall be glad to do so.

GREEN RUBBER.

FROM the *Tropenpflanzer* (Organ des Kolonialwirtschaftlichen Komitees, Berlin) we take the following note on "Green Rubber":—Much has already been written on the extraction of guttapercha from the leaves of the tree by the Rigoles method, and only lately this invention was represented in a very bad light by many publications, whilst previously optimistic opinions prevailed on the other side. Who is right, time must show. But meanwhile the fact remains that the product by this method is placed on the market in quantity and offered to the manufacturers. In the United States shipments made some months ago were favourably received.

In Europe, the well-known firm of H. P. Moorhouse, Paris, undertook the sale of green guttapercha. This firm reports:—Green guttapercha is the extract of the leaves of the *Isonandra*, a tree which hitherto has yielded the rubber of commerce by tapping or by felling. The product has the advantage:—1. Of guaranteeing a constant equal quality to the purchaser. 2. The work of cleaning, which increases the price from 15 to 20 per cent., is entirely done away with. In addition, the material combines the same properties of ordinary rubber with an exceedingly great solidity and elasticity, which must necessarily tend to strengthen and extend the use of the material.

The green colour, which results from the chlorophyl contained in the leaves, can easily be altered or done away with by ordinary chemical process. As it is very plastic and yet very solid, the green rubber can be bent and twisted at will, without breaking. It can be rolled into very thin plates; it gives the most exact and delicate impressions, and withstands the action of water as well as that of the sharpest acids. Even after it has been used and broken up, it still represents a value of about 25 per cent. of the cost price.

The French Telegraph Directory, in order to obtain an authoritative opinion on the product, has employed the new rubber for the repair of deep-sea cables, and experiments made with the most sensitive apparatus have established the fact that, as far as capacity and insulation are concerned, the rubber extracted from the leaves gave better results than were obtained with other first-class rubber. The green rubber works up either when pure or mixed, as in the case of the ordinary crude material, with the only difference that, on account of its purity and homogeneity, exceeding care has to be taken in working it, and this has to be done at a somewhat higher temperature—100 degrees to 120 degrees Réaumur (257° F.)

Entomology.

ORANGE-PIERCING MOTHS—FAM. OPHIDERINÆ.

By HENRY TRYON,
Entomologist.

PLATES XVIII. TO XXII.

YEAR after year, during the months of March, April, and May, growers of citraceous fruit throughout the coastal districts of the colony, complain of loss that they experience through their round oranges falling after exhibiting the following symptoms:—On one or more faces they present a bruise-like appearance, and within this area of altered tissue occur small circular perforations through which juice very gradually exudes. This may be remarked even when, though full-grown, they are still green; the site of the injury being characterised by a pale-yellow colouration that is very conspicuous on the general green hue of the rind.

This injury, as shown by a botanist residing at Rockhampton, named A. Thozet (*vid.* pp. 314 and 315), as early as 1869, is occasioned by the attacks of large moths of one or more kinds, belonging to the family Ophiderinæ.

THE MOTHS.—These are named *Ophideres fullonica*, Linné; *Mænas salaminia*, Cramer; and *Argadesa materna*, Linné.

They are all alike in that they possess the following family characters, being large robust moths, with stout bodies extending not, or slightly, beyond the hindwings. They have both their thorax and hindbody crested and densely clothed. The eyes are large; the antennæ, or feelers, simple and non-pectinated. The fore and hind wings are strongly contrasted, owing to their different colours. The former are dark-hued, exhibiting dark-olivaceous green, brown, or greyish mauve ground-colour or pattern, whereas the hindwings are always bright orange-yellow and more or less marked with black. The expanse of the forewings is from $2\frac{1}{2}$ inches to nearly 4 inches, according to the sex or species. They are, therefore, both large and conspicuously handsome insects.

Mænas salaminia, Cramer (Plate XIX., Fig. 1), unlike the others mentioned, has the outer border of the forewings straight and plane, instead of being arched and scalloped as with them. It is also exceptional in having these organs dark-green with golden reflections, and in having a broad purplish-grey band along the anterior border and a narrow similar band on the outer. In its case both sexes are alike.

Othreis fullonica, Linné (Plate XVIII., Figs. 1 and 2), has the forewings more sharply pointed than are those of either of the other species considered; their external border is, moreover, strongly bowed, though not scalloped (as in *A. materna*). Two lines, also, arising at $\frac{1}{4}$ and $\frac{3}{4}$ respectively along the fore-border cross the wing-surface and tend to converge on the hind-border, dividing the wing-surface, of rich dark-brown of different shades on a pale mauve-grey ground colour that is here displayed, into well-marked inner, middle, and outer areas. The male (Plate XVIII., Fig. 2) in this species is readily distinguished from its consort by the more or less uniform livery of its forewings, that are dark ferruginous or vinous brown. Moreover, in the female, the outer of the foregoing lines is toothed or dentate, instead of being evenly curved, and has a white triangular blotch in one of its denticulations pointing inwards; there occurs also a conspicuous sub-triangular dark-brown blotch in the centre of the wing.

Plate XVIII.



OTHREIS FULLONICA, LINN.

(Male and Female.)



MÆNAS-SALAMINIA, FABR.

ARGADESA MATERNA, LINN. (Male and Female).

Plate XX.



OTHREIS FULLONICA, LINN.

Plate XXI.



OTHREIS FULLONICA, LINN.
(Chrysalis in leaf and isolated.)

Argadesa materni, Linné (Plate XIX., Figs. 2 and 3). In this insect the forewings are, externally, both arched and scalloped. They are also greenish-grey, covered with olivaceous-brown or purple-brown, transverse, confluent, diminutive stripes; in the centre of the wing also are four purple-black spots (corresponding in position to the triangular dark-brown discal mark of *O. fullonica*). The female (Fig. 3) is distinguished from the male in having the minute stripes of colouration of a deeper colour, and in exhibiting, also on the forewings, beneath the central dark spots, a conspicuous white bar that is directed obliquely outwards.

In both sexes of the three insects the hindwings are orange-yellow with each a broad black marginal band and a black—usually half-moon shaped central or discal large patch; the former including also a marginal row of white spots. In *Argadesa materna* this marginal band occupies a greater extent of the hindmargin of the wings than it does in the other insects; moreover, the discal patch is rounded instead of being semilunar, as in their case.

THE CATERPILLARS (Plate XX.).—All three insects have caterpillars of similar cylindrical form, measuring two or more inches in length—when fully grown. They have the 11th segment of the body considerably humped. Otherwise they are quite even and smooth. They are unclothed, save for the presence of minute hairs. Like other Noctuæ, they have each eight pairs of legs—viz., three thoracic clawed, and one terminal, and four intermediate unclawed ones—the anterior pair of the last group being rudimentary. In each case also the caterpillars vary in colour at different periods of their growth, but have in common two large spots or ocelli on either side of the body occupying nearly the entire breadth of the 6th and 7th segments. These spots are very conspicuous, being white and often coloured with very marked hues.

In the case of *Ophideres salaminia*, the full-grown insect is, as stated by A. W. Scott, “throughout of a deep rich velvety-black, minutely powdered with small spots of pale-blue and straw-coloured.” Moreover, the eye-spot or ocellus is very gaudy, “possessing a black pupil with a blue centre, and an iris yellowish above and saturnine-red below.” Further, “the penultimate segment bears a reddish prominence, from which proceeds along each side a delicate tracery of white, resembling the fine fibrous roots of a plant.” Examples of this caterpillar are also occasionally of a dull-reddish hue, and exhibit some variation as regards detail in the markings that they present.

The caterpillars of *Othreis fullonica* (illustrated by photo-lithography on Plate XX.) are of shades of rich brown, varying greatly in intensity, in different examples, especially such as exhibit diverse ages. They have also numerous small creamy-white black-edged spots and bars, on the upper surface of the body, that tend to coalesce in places. The large eye-spots are, however, as a rule, far less gaily coloured than is the case in *O. salaminia*, being often wholly white and black.

THE CHRYSALIS.—The chrysalis (Plate XXI., Fig. 2) is of a very dark-brown colour with usually a purplish cast. It is somewhat roughened anteriorly. Its tail end is blunt, and at its opposite extremity it is obliquely truncated. That of *O. salaminia* may attain a length of nearly an inch.*

RANGE OF OCCURRENCE.—All three insects have a widely extended range of occurrence beyond the confines of the Australian continent.

HABITS.—The eggs are deposited upon the foliage of the plant or plants destined for the support of the caterpillars to which they give rise.

* Coloured representations of the above-mentioned caterpillars and chrysalises, with more or less full descriptions, are given by F. Moore in “The Transactions of the Zoological Society of London,” Vol. XL., Plate XII., Figs. 3, 3a, 3b; and by the same authority in Vol. III. of the “Lepidoptera of Ceylon,” p. 134, and Plate 161 (1884). Similarly, *O. salaminia* is dealt with in A. W. Scott’s “Australian Lepidoptera and their Transformations,” Vol. II., Part X., pp. 6-7, Plate XI. (1890).

Food Plants.—These food plants comprise several distinct species of Menispermaceæ—twining with usually large orbicular or ovate-cordate leaves growing as a rule in the scrubs. Local observations, conducted by Messrs. F. P. Dodd, T. Batcheler, and the writer, prove that the following are included in this category. Representations of the foliage of the several ones described, in each case reduced in size, are given on Plate XXII. :—

(1.) *Pericampylus incanus*, Miers, or Moore's *Cocculus* (as obligingly identified by the Colonial Botanist, F. M. Bailey, F.L.S.), Plate XXII., Fig. 4. A widely-extending rampant climber with smooth bright, green "vines," along the course of which occur alternatively, at rather remote intervals, usually large leaves. In the case of the young growth both the stems and leaf-stalks, as well as the leaves—their upper surface especially—are hispid with short erect pale tawny hairs; but these are lost with age, so that the plant becomes ultimately smooth and glabrous. The leaves are provided with leaf-stalks (petioles) from 4 inches to 6 inches in length, and these are suddenly thickened at their points of attachment with the stem. They are broadly ovate—when old sometimes almost orbicular—and apiculate or tipped with little points. Occasionally—especially in young plants—they are excavated or lobed at the base. They may attain a measurement of 7 inches by $6\frac{1}{2}$ inches, but are usually somewhat smaller. Above they are dark glossy-green with paler veins; beneath they are sage-green or glaucous, with the raised veins yellowish-white. These are raised, and radiate from the point of attachment with the leaf-stalk to the margin, being connected with numerous irregular veinlets. The flowers are small, green, and inconspicuous, and occur on branched stalks in the axils of the leaves. The fruit is a red-coloured berry (drupe), measuring 4 to 6 lines in length, and includes a small round compressed stone. This food plant was indicated by T. Batcheler as one to which *O. fullonica* is especially partial. (For a full description the reader is referred Mueller's "Fragmenta," Vol. I., pp. 162-3; Melbourne, 1858-9.)

(2.) *Stephania hernandiæfolia*, Walp. (Plate XXII., Fig. 1). A winding climber that may reach several feet from the ground, when the support of neighbouring bushes is available, but that otherwise forms dense low masses. The stems or vines are slender, brownish hued, and faintly furrowed. The leaves are alternate on the stems and, placed somewhat distantly from one another, are broadly-ovate or almost orbicular, suddenly narrowed to a point at the end, and measuring from $2\frac{1}{2}$ inches to $3\frac{1}{2}$ inches. They have a somewhat fleshy consistence and their under-surfaces are paler green than their glossy upper ones, and slightly velvety or pubescent, owing to the presence of numerous short whitish hairs. The leaf-stalk is from 2 inches to 3 inches long, peltately fixed—i.e., inserted at a point situated well (usually $\frac{1}{4}$ -inch) within the leaf margin. The primary veins or nerves are raised, and radiate from the point of attachment of the stalk, being from 8 to 10 in number. The flowers are minute, and occur in umbels on short stalks in the axils of the leaves. The fruit is orange-red and smooth, and measures about $\frac{1}{4}$ -inch in length. This plant seems to be especially common on shaded rocky declivities along the sea-coast, where it may form dense masses. (For a full description, the reader is referred to F. Mueller's "Plants Indigenous to the Colony of Victoria," Vol. I., pp. 220-221. Melb. 1860-2, and to more recent publications. It appears also to be the plant figured in A. W. Scott's "Australian Lepidoptera and their Transformations," Vol. II., Part 1, with the designation *Sarcopetalum Harveyanum*.)

(3.) *Stephania aculeata*, Bail. "The Prickly-stemmed Stephania." (Plate XXII., Fig. 3.) This is also a climbing plant, but one of much more slender habit than is *P. incanus*. Its stems and leaf-stalks are armed with thickly-set fine, brownish-coloured spines, each measuring about $\frac{1}{8}$ inch in length. The leaves are of a pale-green or bluish-green colour, have rounded lateral angles, and are gradually narrowed towards the tips. They are, moreover, peltate, having the point of attachment of their stems placed some distance (about $\frac{1}{4}$ -inch) within the margin. They may measure from 3 inches by $2\frac{1}{2}$ inches, but are usually smaller. Their veins also have a radiate arrangement. According to F. M. Bailey, the male flowers are minute, and occur in cymes, the hair-like branches of which bear bracts in the axils of the leaves. Both the female flowers and fruit have not hitherto been described. (For a full description, except for the last-mentioned exception only, reference may be permitted to F. M. Bailey's "Contributions to the Queensland Flora," Bulletin 9, page 7; Department of Agriculture, Brisbane, 1891.) Though evidently not an uncommon plant in the scrubs adjacent to Brisbane, its appearance was, it seems, overlooked till November, 1887.



Foliage
of
Food Plants of Orange Moths

(4.) (?) *Tinospora smilacina*, Benth.* (Plate XXII., Fig. 2.) A fourth food plant, to which this name is provisionally attached, is figured on Plate XII. It is of more slender habit than either of the others described, and the 5-nerved leaves are longer. The material available for description is, however, meagre, and cannot be immediately supplemented. J. G. Luchmann stated regarding it, and having the material figured alone before him:—"As you correctly observe, it looks like a Menispermaceous plant (though it may be something else). . . . It greatly resembles *Tinospora smilacina*, but that plant does not extend as far south as Moreton Bay, and has, as a rule, blunter leaves."

The caterpillars (as also shown in the photographic illustration embodied in Plate XX.) when at rest assume many strange attitudes. They may support themselves from one or other extremities of the body, or even hold the head and tail up at the same time. When resting on their abdominal feet, moreover, they are wont to curve their head under so that its top may come in apposition to their chest. When molested they may successively assume different attitudes, jerking their bodies to one side or the other; or, as usually happens, throw themselves to the ground. They are somewhat voracious feeders, and individual specimens will partake of several different species of Menispermaceous plants without apparent detriment to their vitality. According to the observations of T. Batcheler, it would appear that many become full grown ("full fed") in about three weeks from the time of hatching.

When this event has happened, the caterpillar fastens adjacent leaves of its food plant together, or fragments of these, and, within the enclosure thus obtained, spins a very delicate cocoon of white silk, attaches itself by its tail, and then passes into the chrysalis state (*vide* Plate XXI., Fig. 1). About three weeks elapse before the moth emerges from its chrysalis.

The last-mentioned observer is of opinion that the insects, or at least *O. fullonica*, pass the winter as moths, since he has met with much faded, evidently, therefore, old, specimens about as early as September; and that the hibernated females, laying their eggs in spring, give rise to the small brood that is to be met with in South Queensland in November and December. T. Batcheler also states that after December there is a succession of broods until May, straggling examples occurring up till the 18th of that month. They are very strong fliers, and pass with facility over long distances in quest of food for themselves or their young. Thus P. McLachlan records having taken *A. materna*, Linn., at sea 300 miles from Mauritius, the nearest land (Proc. Ent. Soc. Lond. 1877, page 5).†

According to the observations of T. Batcheler, both *O. fullonica* and *Mænas salamina* are on the wing principally between the hours of dusk and 11 p.m.‡ What is the term of existence of the perfect insect is not known, but it has been remarked by the writer that the same insect may occur at night in the same spot during a period of several days. Though they may travel in the first instance long distances to attain food that is provided for them, and thus a far distant growth of a Menispermaceous food plant serve to afford pests for fruit trees close at hand, there are grounds for concluding that having once reached this goal they are addicted to remain in its neighbourhood for some time, since they have been observed sheltered in dry brushwood in the neighbourhood of orchards, and where they could not have originated. On the other hand, orchards that adjoin scrubs in which Menispermaceous

* The discovery of this plant as a food plant of *Othreis fullonica* is due to F. P. Dodd, to whose extensive knowledge of the Lepidopterous fauna of Queensland the writer is under many obligations.

† This facility for making long excursions, coupled with the general partiality of their caterpillars for several different plants comprised within a single order—*i.e.*, Menispermaceæ—coupled with the fact that such plants themselves have a wide extra-Australian range of occurrence (*Stephania hernandiaefolia* being found, according to Messrs. G. Bentham and F. Mueller, "from Eastern Africa, almost all over India and the Archipelago, and northward to China," and *Pericampylus incanus*, also, being "common in Eastern India, India, and the Malayan Archipelago, extending northward to South China"—*vid.* "Flora Australiensis," Vol. I., pp. 56 and 58), explains the fact that the species of Ophiderinæ that are met with in Queensland also occur in several far distant lands.

‡ However, the moths are not attracted by light.

plants occur—and whence it may be inferred the moths emanate—suffer as a rule to a greater extent from the special depredations that they occasion than do others that have no such environment.

The habit of the moths, however, which has led to this communication, is that of boring with their horny probosces, or antilia, through the rind of the ripe or ripening orange for the purpose, that they thus accomplish, of imbibing the juice of the fruit. Several not infrequently alight on a single orange with this object, and are to be observed with their probosces still inserted deep into the rind, so that their capture may be readily accomplished. As a result of these injuries, that in great part consist in air being admitted to the fruit-pulp beneath the rind, the orange drops to the ground and quickly rots.

Some have denied, as is more particularly set forth in the concluding section of this article (*vid.* pp. 314 and 315), that these moths perforate the fruit themselves, as they regard this action on their part as a physical impossibility. On the other hand, they assert that the moths, though they visit the fruit and imbibe its juices, yet avail themselves of the holes that have been already made by other insects, and thus suck the juice through channels in whose preparation they have taken no part. The only insects, however, that have been specifically mentioned as probable precursors of these attacks are the ordinary Fruit Fly and an orange-frequenting Green Plant Bug with thorn-like expansions on each side of its thorax—a species of *Rhynchocoris*. The latter, however, restricts its attention to green immature fruit, which it certainly probes; and the former, or Fruit Fly, though it may no doubt occasionally act in the capacity referred to, and the moth avail itself of a means of access to the juice of the fruit that it has provided, does not invariably do so, for it generally happens that damaged fruit harbours neither eggs nor fly-maggots, a fact ascertainable by direct observation, and inferred from the circumstance that fruit flies cannot invariably or even often be reared from damaged fruit, which would be otherwise were the ovipositor or egg-placer of the fly the exclusive agent in making the perforation.

As concerning the allegations that it is a physical impossibility, it should be borne in mind that F. Moore, the able monographer of the Ophiderinæ, whilst referring to the exercise of this habit in *Othreis fullonica*, does not express any doubt regarding the accuracy of the observations that have given rise to the narrative that he quotes; nor, indeed, does he question the ability of the moth itself to perform the mechanical operations that such depredations as have been attributed to it involve. Moreover, the curious and exceptionally formed proboscis (or applied maxillæ) has been shown by a French naturalist, J. Künckel d'Herculais (*cf.* "Historical," pp. 314 and 315), not only in the case of *Othreis fullonica*, but also in those of *A. materna*, *M. salaminia*, and *O. imperator*, as well as other species, to be specially and exceptionally adapted to *this end*.*

This proboscis, or antilia, is made up of two applied maxillæ, and about one-eighth part of its length is occupied by the teretron or borer. This is a double organ, consisting of two similar halves. One of the halves, or what really is the end of a maxilla, is thus described by Dr. R. B. Read, of Sydney, whose account of it is here given to escape the generally undesirable act of translating an author's description, as would have been necessary in making use of Künckel d'Herculais' memoir; and since it is most accurate with regard to detail:—

Upper and Outer Surface.—Tip acutely pointed, expanding upwards into three barbs, two of which, the first and third, are placed on the outer side, whilst the second is intermediate between them, and next the line of junction with the maxillæ. From the barbed portion the terminal begins to expand, and on its upper surface is presented, in a line above the second barb, a curved projection terminating abruptly, showing a sharp oval gauge-like edge; the interior of the projection is sharply

* Les Lepidopteres, à trompe perforante, destructeurs des oranges. Compt. Rendus, 61, Paris, 1875, pp. 397-400, and Plate.

hollowed out, and from it arises a large rounded tooth-like process. From this point commence two or more rows of thickly-set setæ, which continue the whole length of the antilia (the two applied maxillæ, or proboscis). Above and on the outer side of the terminal is placed, diagonally, a second process similar to that already described, whilst above in a line between the first and second, occurs the third. The fourth is placed above, and in a line alternating between the second and third. The fifth is similarly placed in relation to the third and fourth; and the sixth and last in respect of the fourth and fifth. Each superior process is slightly larger than that below it. At the base of the sixth process, in a slightly cupped hollow, is a solitary long spine, whose office may be to prevent the teretron being plunged too deeply into fruits to permit of withdrawal.

Under Surface.—Tip acutely pointed, expanding upwards, then suddenly contracting, gives a sharp transverse ridge one half-way up the barbed portion, which again expands upwards and outwards and forms a second sharp-edged transverse ridge. The remainder of the terminal is divided unequally into three divisions, each of which presents a very strong, sharp, lancet-like process. At the junction of the terminal with the remainder of the maxillæ are set diagonally upwards and outwards four conically-shaped spines; then, a space intervening, there is placed higher up the maxillæ a set of three similar spines; after a longer interval a set of two spines occurs, and finally a single spine is placed at a considerable distance from the last two, making ten in all placed like the teeth of a long harrow.

Furnished with this extraordinary apparatus (Dr. Read concludes) these species of *Ophideres* are able to pierce the skin of the orange even before it has turned yellow, two of them sometimes attacking the same fruit.*

Having seen, then, with how perfect a boring apparatus these moths are provided, it would seem highly probable on *a priori* grounds, were no observations as to the manifestation of the habit forthcoming, that they would not adopt exclusively the procedures referred to in gaining access to the juice of the orange, but might rather oftentimes perforate its investing rind; that when an individual moth found no previous channel into the pulp, or, in the case of several moths simultaneously visiting a fruit, a sufficient number, it would bring the borer into requisition.

Insects might, perhaps, be mentioned that are endowed with more efficient penetrating organs than are those of the species of *Ophiderinæ*; but then, conjoined with evidence of the possession of these is required, from those who deny that moths can perforate fruit, proof that these specially favoured insects, on their part also, manifest this habit. But of the insects that seek admission to the pulp of the orange as directly affording them food, or as furnishing a nidus in which to deposit their eggs, the writer knows of none so competent as are the so-called orange moths to effect a passage through the rind.

In Queensland these moths do not confine their attention to oranges. Some seasons back it was reported that at Glen Prairie, near Rockhampton, a moth, that proved to be *Ophideres fullonica*, was making great havoc amongst the mango fruit, by alighting on it and extracting its juice. From other parts Orange Moths are reported as damaging bananas in a similar manner. In the vicinity of Brisbane, at a time when ripening oranges are only exceptionally, if ever, to be found, the writer has seen these moths amongst grape-vines loaded with ripe fruit, and, as elsewhere remarked by him, the ready way in which some grapes, notably the Black Hamburg, shed their fruit may be possibly ascribed in some cases to the fact that Orange Moths have visited the bunches.

* Read (Dr. R. B.). "Lepidoptera having the Antilia terminated in a Teretron or Borer." Proc. Lin. Soc. N.S. Wales, Vol. III., 1879, pp. 150-154, accompanied by a carefully-executed Plate.

For further information on this subject reference may be made to an elaborate paper contained in the "Quarterly Journal of the Microscopical Society," Vol. XL., 1875, entitled "On the Structure of the Proboscis of *Ophideres fullonica* or Orange-sucking Moth." In this F. Darwin not only recites A. Thozet's observations, but also gives a *resumé* of an article by —. McIntyre published in the "Monthly Microscopical Journal," of May, 1874, on boring Lepidoptera of the Cape of Good Hope, the proboscis of one of which resembles, as is stated, to some extent that of *O. fullonica* described and figured by M. Künnkel, and is competent to penetrate the skin of the hand when attempt is made to grasp the insect possessing it.

REMEDIES.—(1.) By means of the cane or scrub knife cut off at the roots all plants which it may be concluded, by direct observation, support the caterpillars, or moths in their immature state, or that may be identified with food plants from the descriptions previously given (pp. 310 and 311), and growing in scrubs or on rock banks in the vicinity of orange orchards, and destroy at the same time whatever caterpillars or chrysalises may be thus encountered.

(2.) Where it is practicable, and economically justifiable, destroy the entire woody vegetation where such food plants may be expected to exist.

(3.) Remove all brushwood from the vicinity of orange orchards, that the moths may have little or no harbouring places in the intervals between their nocturnal visitations.

(4.) Afford, if practicable, a counter-attraction; and capture or net the moths thus diverted from pursuing their destructive work. They are especially partial to highly flavoured bananas of the Cavendish type. Thus, suffer to remain on one or two of the latter plants, if growing conveniently, as many bunches; till the over-ripe fruit drops to the ground. Or, preferably, hang in places that can be conveniently visited, wrapped in calico, small bundles containing similarly conditioned fruit of this description—five or six bananas in each. These to be nightly visited with lantern and net in hand, when the not readily disturbed Orange Moths amongst others may be captured.

(5.) Poison the moths by impregnating the bananas with a syrup containing a small proportion of arsenite of potash made by boiling equal weights of white arsenic (arsenious acid) and bicarbonate of potash in water. Sixty-four grains of each of the chemicals named to 4 oz. of water form convenient proportions for the manufacture of the poison.

It must, however, be borne in mind that the best results may be obtained by beginning operations long before the season for oranges commences. From what has been already stated (*vid.* p. 311) the early broods of the insect—viz., those that occur before the end of December—are comparatively small, but from them arise, by accessions with the birth of each successive brood, the very large numbers that visit orangeries notorious for injury to their fruit of the nature described.

HISTORICAL.—The subjoined statement, since it serves to show the part played by one of Queensland's pioneer and ablest scientific workers in elucidating the facts narrated, and also bears upon the subject dealt with, may be not altogether devoid of interest to those who may feel induced to further prosecute this inquiry.

The fact that one of the moths mentioned—viz., *Ophideres fullonica*—injured oranges in the manner described was discovered as early as 1869 by A. Thozet, a French botanist resident at Rockhampton, and recorded by him in the Rockhampton *Bulletin* of that year. In 1871 he further made this known to Mons. J. Künckel d'Herculais, assistant naturalist at the Paris Museum of Natural History, accompanying his statement with illustrative examples of the insect concerned. Again, in May, 1875, the destructive rôle enacted by these insects was again enlarged upon by A. Thozet in a communication over the signature "Pomona," appearing in the Rockhampton *Bulletin* of — May and the *Capricornian* of 8th May.

The well-known Queensland lepidopterist, W. H. Miskin, disputed this finding in a letter "On Insect Enemies of the Orange," printed in the *Queenslander* of 22nd May, 1875. To this "Pomona" furnished an able reply, dated 10th June, 1875, that appeared in the Rockhampton *Bulletin* of that month.

This controversy between A. Thozet and W. H. Miskin, in 1875, having been in due course brought under notice of d'Herculais, he was now induced to again consider the former's allegations, and, as part of his inquiry, to examine the proboscis or sucking organ of the moth to which it referred. This renewed investigation on his part then brought to light the marvellous and exceptional structure that it exhibited, and that seemed to answer so well

to the function of piercing comparatively hard substances that had been attributed to it by Thozet. This he made known in a special memoir entitled "Les Lepidopteres, à trompe perforante, destructeurs des oranges," that was communicated by Emile Blanchard to the French Academy of Sciences, on 3rd August, 1875, and printed in the annals of that society (*vid. Compt. Rendus* 61, Paris, 1875, pp. 397-400, and Plate).

F. Darwin also on his part described this strangely fashioned piercing organ of *Ophideres* in the "Quarterly Journal of Microscopical Science" for 1875, and wrote on 22nd August to A. Thozet, "congratulating him on his discoveries," remarking that they supported his own observations on the habits of *Phalenes* that perforated the nectaries of certain flowers.

M. Künckel d'Herculais' paper, that created very great interest amongst scientific men, is reprinted in the "Annals and Magazine of Natural History" for 1875 (*vid.* 4 Series, Vol. XVI., pp. 372-4, 1875), and also summarised in the "Gardeners' Magazine" for the same year. It was also incorporated in an able paper read before the Paris Acclimatisation Society by Mons. Aime Dufort shortly afterwards. Dufort's paper has been made known to Australian readers, for, having been translated into English by the editor of this *Journal*, A. J. Boyd, and communicated to the *Queenslander*, it appeared in its issues of 14th July and 21st July, 1877.

Prior, however, to the important discovery being made known in the colony, another Rockhampton correspondent (G. L. Pilcher) had also publicly disputed A. Thozet's contention, in a letter dated 23rd March appearing in the *Queenslander*, 7th April, 1877; and his views on this subject, having been meanwhile communicated to a well-known British entomologist, found expression also in "Cistula Entomologica" of 1877, pp. 237-40.

W. H. Misken, as referee to the *Queenslander* on entomological topics, again impugned the accuracy of A. Thozet's observations in the *Queenslander* of 11th May, 1878, without comment, however, on the confirmatory discoveries on the part of d'Herculais and F. Darwin. Thozet, however, found a local champion in Robert Grieve, who also wrote to the *Queenslander* on "The Enemy of the Orange," narrating similar observations made in the vicinity of Brisbane to those that the former had made at Rockhampton.

In 1879 Dr. R. B. Read, of Sydney, published his independent researches on "Lepidoptera having the Antilia terminated in a Teretron or Borer," in a paper, already quoted, read before the Linnean Society of New South Wales, and appearing in Vol. III. of its "Proceedings" (*op. cit.*, pp. 150-154, 1879). In this appears an excellent figure of the distal extremity of the proboscis of *Ophideres fullonica* and *O. salaminia*.

Again, the present writer discussed the whole subject fully in 1889, in an article entitled "Orange Moths—Fam. Ophiderinæ," appearing in his Report on Insect and Fungus Pests (*op. cit.*, pp. 101-104, *Brisb.*, 1879).

Finally, the same theme is briefly dealt with from another point of view by A. Sidney Olliff and H. Forde in A. W. Scott's "Australian Lepidoptera and their Transformations" (*op. cit.*, Vol. II., Part I., pp. 6-7, 1890).

DESCRIPTION OF PLATES.

PLATE XVIII.—*Othreis fullonica*, L. Male and female. (Original.)

„ XIX.—*Mænas salaminia*, Cram., and *Argadesa materna*, L. Male and female. (Original.)

„ XX.—*Othreis fullonica*, L. Caterpillars from life. (Original.)

„ XXI.—*Othreis chrysalis*. Natural mode of occurrence and isolate. (Original.)

„ XXII.—Foliage of Menispermaceous food plants of Ophiderinæ. Dimensions reduced. (Original.)

(1) *Stephania hernandicefolia*, Walp.

(2) (?) *Tinospora smilacina*, Benth.

(3) *Stephania aculeata*, Bail.

(4) *Pericampylus incanus*, Miers.

Forestry.

SOME TIMBER TREES OF QUEENSLAND.

By J. W. FAWCETT,

Member of the English Arboricultural Society.

PREFACE.

IN the following articles, which comprise the observations of the writer together with those contained in the writings of others who have studied, either in part or as a whole, the forest flora of this great island continent of ours, I shall try to give a concise account of some of the more valuable timber trees of this colony which form a great part of our industrial and commercial productions.

Should any reader be able to give the sizes of any large trees in the colony, or furnish photographs or sketches of any forest giants, I shall be most happy either to receive or see in the *Queensland Agricultural Journal* such notes or productions or photos.

INTRODUCTORY.

Owing to its vast area and its diversity of altitude, climate, and soil, Queensland possesses a greater variety of indigenous trees than the other colonies, and perhaps more than could be found in a similar extent of country in any other part of the world. In the earlier days of settlement there were, and in several undeveloped and unsettled districts there are still, immense tracts of country covered with magnificent forests, which yielded and will yet yield timber unsurpassed for many purposes by kinds produced in other parts of the continent and the world. Through neglect, and, what may be termed bad usage, together with the great want of legislation on the matter, our native forests are becoming rapidly exhausted. In many districts, and especially around the larger centres of population, where, only a few years ago, first-class timber was abundant, it is now getting scarce, simply because the trees (irrespective of species) have been ruthlessly destroyed by sawyers, settlers, splitters, and timber-cutters, without making any provision for the renovation of the forests and for future supplies. Though we still have considerable supplies of timber trees available, yet they are annually rapidly diminishing, and unless a regular system of forestry is adopted it is only a question of time when the supply will more or less fail us. With proper care our supplies of timber may be made to increase and become equal to colonial demands. What is wanted is *forest conservation*, for the time is at hand when it is necessary to legislate for the future supply of useful timbers. By so doing a complete change would doubtless be brought about, and what must eventually become an important and valuable industry would be saved for posterity.

The cultivation of timber trees is a labour which might be carried on to a greater extent by the Government and by private individuals with profit. As our indigenous timber trees vary considerably in their requirements, and as we possess species suitable for every variety of climate and soil, the many lands which are too poor for remunerative cultivation or pasture might be profitably utilised in the growth of certain species of timber trees. It is also quite possible for us to cultivate with success many exotic species, for, though our native trees are excellent, they are mostly hardwoods, and unsuitable for several purposes,

and therefore we have to import other kinds, principally softwoods, in large quantities. Almost all the imported species could be grown successfully in our colony, and thus thousands of pounds would go into colonial hands, and provide employment for an increased population (the colonial revenue consequently being increased), which now go elsewhere.

NOTE.—In the descriptive accounts of the timber trees of Queensland given in this series of articles, no scientific arrangement has been followed.

SOME TIMBER TREES OF QUEENSLAND.

I. THE BLOODWOOD (*EUCALYPTUS CORYMBOSA*, Sm.)

BOTANICAL DESCRIPTION.—The Bloodwood, one of the most common of our Queensland timber trees, is a tree of varied size. In the coastal districts it is only a small, stunted, or middle-sized tree, whilst in inland districts it becomes a fair-sized tree, often attaining large dimensions. In height it varies from 50 and 60 feet to as much as 100 and 120 feet, with a diameter of from 2 to 4 feet or more.

Bark.—The bark is rough, spongy, or porous, furrowed, and slightly fibrous, somewhat scaly in appearance, of very rapid growth, and rich in kino or gum. It covers the whole of the trunk of the tree, and the branches, extending even to the tips of the smallest twigs. It is of a reddish-brown colour, more or less blotched with blood-like stains of gum or kino.

Leaves.—The leaves are rather thick, alternate (that is, one above the other), or opposite (that is, in pairs, one on one side and the other on the opposite side of the stem); lanceolate (or like a lance-head) or ovate-lanceolate (eggshaped or broadest at the base) in shape, and tapering to a sharp point; from 3 to 6 inches in length; with numerous transverse (running at right angles from the mid-rib (middle-vein) to the edge of the leaf) parallel veins, often so fine as to be scarcely visible. If the young leaves be pulled asunder, a number of fine glutinous or sticky threads will be noticed, like indiarubber in appearance and substance. When the leaves shoot from an old butt or trunk they are often covered with numerous fine hairs.

Flowers.—The flowers are rather large on short stems (pedicels) about a quarter of an inch in length, three or four or more on a larger stalk (peduncle), the whole of these forming a kind of terminal corymbose panicle—that is, the branches upon which the flowers grow are of various lengths, and the whole raises all the flowers until they are about the same height. They are white or creamy in colour, and appear in blossom from November to February, and even as late as April. It flowers very profusely, and at a very early age.

Fruit.—The fruit is urceolate, or shaped like an urn or little pitcher, from half to nearly an inch in length, with numerous large eggshaped seeds, each more or less bordered by a narrow wing.

VERNACULAR AND SCIENTIFIC NAMES.—The Bloodwood derives its vernacular or common name from the kino, or gum as it is more commonly called, which exudes, often in large quantities, from the trunk of the tree, and which, when newly exuded, has every appearance of a stream of blood. The family name, *Eucalyptus*, which is given to the whole of the “gum” trees (so-called) of Australia, is derived from two Greek words—*Eu*, well, and *Kalypto*, I cover, and was given to the family by the French Botanist, C. L. de Brutelle L’Heritier, in allusion to the little, somewhat conical, cap, which covers the unexpanded flower, and which is thrown off when the flower opens. The specific name, *Corymbosa*, is from the Greek *Korumbos*, or Latin *Corymbus*, a summit, and was given to it by Sir J. E. Smith (the founder of the Linnean Society) from the form of the inflorescence. A perfect corymb is one where the stalk of each individual flower is gradually elongated, or lengthened, in such order that all the flowers are brought approximately to the same level on the top. That of the Bloodwood, however, is not a perfect one.

DISTRIBUTION.—The Bloodwood is the commonest Eucalypt or “gum-tree” of Queensland. It is widely spread over the whole of the colony from North to South; but is more plentiful in the coastal districts, where it also attains the greater magnitude, than in the inland districts. It is also found in the Northern Territory of South Australia and in New South Wales.

USES.—The Bloodwood furnishes a dark-red, heavy *timber*. When young or newly cut it is soft, but it gradually hardens with age and seasoning. It is very subject to gum-veins, or cavities containing large quantities of kino or “gum.” This defect has caused a great deal of prejudice against the timber, as it will not do for sawn timber. It is very strong and durable underground, and is therefore a good timber and muchly used for fencing posts and rails, railway sleepers, and rough building purposes. For works where it can be used uncut, such as house-stumps, piles for bridges, &c., it is a durable timber. Though greatly used for firewood, it will not readily take fire, nor does it suffer much from the attack of white ants (termites).

The *kino*, or “gum,” which exudes from the Bloodwood, is of a blood-red colour, and has a distinct vinous smell. It is found in cavities between the bark and the stem, or between the concentric circles of the wood. The gum-veins are often increased to the size of pockets, owing to the tendency of the timber to shell, and the hollows thus formed to be filled with extravasated kino. When it exudes through the bark it forms patches which look as if covered with blood, whilst the ground at the foot of many of the trees is often so covered with kino as to look like blood-stained earth. In appearance it is the most brilliant of all kinos. It is exceedingly friable, and is highly astringent. It contains 43·71 per cent. of kino tannin, and is also rich in “insoluble matter kinoised, especially catechu and kionoin” (K. T. Staiger). The aborigines used to employ this “gum” or kino for tanning animal skins, and it is also chewed with some effect for dysentery.

The *bark* furnishes a good medicinal charcoal, and was at one time used by the aborigines of the Moreton Bay district as an antiseptic application to cuts and wounds.

The *leaves*, like all other Eucalyptus leaves, contain a quantity of oil, but not in sufficient quantity as to warrant the extraction commercially profitable. It is colourless, but rich in cineol (eucalyptol).

The chief characteristics of the Bloodwood (features which distinguish it from other Eucalypts or gum-trees) are:—

1. The scaly appearance of the bark;
2. The fine parallel venation of the leaves;
3. The size of the flowers—larger than those of many other gums—and their corymbose form; and
4. The shape of the fruit, which is unlike that of any other Eucalypt.

TIMBER-GETTING IN AUSTRALIA.

BY A. PITMAN CORRIE.

AUSTRALIA, in the main, is amply clothed in forests. These forests stand settlers in good stead, and supply timber which has a commercial value fitting it for export. But there are patches of Australian soil quite bare, and in these parts the settler is at his wits' end to know how to get enough timber to build the primitive domicile which he calls his “humpy,” or to erect fencing to check the wanderings of his flocks and herds. Of these colonies South Australia is the worst off in the matter of timber supplies, and with respect to this we may say that her lot has fallen in an unpleasant place. “Nature, a

mother kind alike to all," has seen fit to deny to this colony of "magnificent distances" great forest resources; but, doubtless, has made up the deficiency in some other way for—

Though patriots flatter, still shall wisdom find
An equal portion dealt to all mankind.

In consequence of this deficiency, due to the compensating balance of Nature, forestry has received great attention in South Australia. At some of the reserves it has been brought to a fine art, and a few years ago timber, cut from trees which had been planted and tended by human hands, was sold to timber-getters for fencing and other purposes. Of course this statement will not appear incredible to those who have knowledge of the rapidity with which, under favourable conditions, the Eucalyptus grows. This is demonstrated in America, and also on the Continent, where trees of the Eucalypt family have been planted in the interests of health, and also in the forestless parts of Australia (notably Mildura, Victoria, and Renmark, South Australia), where "gums" have been grown to form breakwinds for fruit trees.

In all the Australian colonies, with the single exception of South Australia, timber-getting has become an important industry, and has played, and is still playing, an important part in the opening up of country for settlement, and subsequent development.

Take, for example, Queensland. Much of the pioneering in the eastern slope of the colony was done by men engaged in timber-getting. In the early days (and it must be borne in mind that twenty-five to thirty years covers the whole history of some districts in this category)—in those days these men would go to the mouth of a coastal river, where they would make a rendezvous and a centre for their operations. From thence they would penetrate the dense scrubs, and traverse the broad belts of forest timber in quest of cedar and pine logs.

These men seem to have been hardy fellows. Probably their hard life and wild surroundings stamped their rugged features with some of the sternness of the bleak Swiss. They often ventured, in their quest, where civilised man had never set foot, and cut tracks which in many rugged and romantic spots are the roads of to-day and the inlets of civilisation. The men who afterwards came to these sequestered places—

Where the silver water sings,
Down hushed and holy dells,

to settle on the soil, frequently followed in the wake of the timber-getters; though, usually, like Peter, "afar off."

No one who has not trudged and tramped through the unkempt scrubs of Queensland—no one who has not been "within the maze" and seen it in its wild and native grace—can appreciate the difficulties the pioneers had to face. The impenetrability, the confusion, the entanglement cannot be described; while for general "riotous conduct" it would be hard, indeed, to surpass a scrub scene. (*See Illustration.*) It is amongst those matted masses of "lawyer" cane, of spiked stems, of thorny vines, and bewildering creepers, which challenge every forward step—on stony hillsides and in broken glens—that the coveted cedar and hoop pine grow.

Bullock-teams are used for extracting the logs; in fact, no other motive power could do the work. The bullock is a patient and a long-suffering animal, very slow, but equally sure. Under favourable conditions his lot is by no means happy, but when engaged in timber-getting his life, like that of his master, is rough enough, and his living at times precarious. But, fortunately, he has the power of adaptation strongly developed, and soon becomes inured to hardship and privation. It is an exciting thing, and should prove quite a revelation to the inexperienced, to see a team of bullocks bringing a huge pine log down a mountain side. The driving of the team is either a fine art governed by laws of great precision, or else it is simply a thing of chance in the hands of the Fates which preside over the life of the timber-getter.

In the early days the logs were all collected on the banks of the coastal rivers at places called "rafting-grounds." At these spots, as the name implies, they were formed into rafts and floated down stream to large mills often found at the mouths of these rivers. But two elements, the result of more recent development, have disturbed the old system. In the first place, as settlement increased, and local demand became greater, steam sawmills, portable in character, were erected to meet the demand; and, secondly, in later years railways were introduced, and much timber which formerly found its way down the rivers now goes to large mills in the various centres of population.

Before the introduction, however, of small mills called into existence to meet the growing demands of settlers, the local needs were supplied by pit-sawyers; and even to-day, in accessible parts, apparently only a stone's throw from railways, yet—

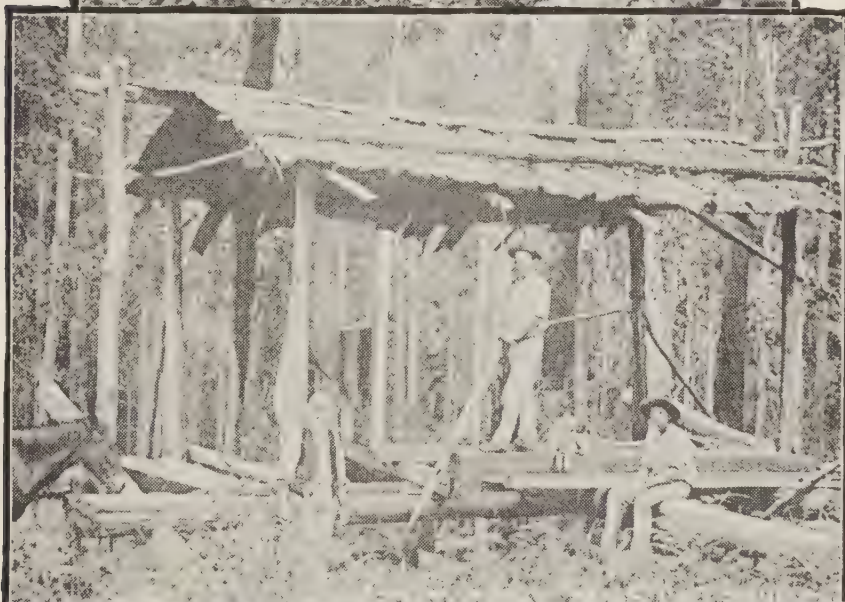
Far from the madding crowd's ignoble strife,

saw-pits still keep "the noiseless tenor of their way." Notwithstanding, this is not so common as it was, and certainly the greater number of "pits" one meets with belong to a past age.

Pit-sawing, as a feature in early settlement and an accomplishment needed in the pioneer, is an interesting process, which one of the accompanying pictures fairly illustrates. A rude staging of saplings is erected over a long and narrow pit. Logs are rolled by means of long "skids" on to this staging. The saw is worked by two men called the "top" and the "bottom" sawyers. The "top sawyer" is the skilled labourer, and understands the art of saw-sharpening. He has the general directing of affairs—hence the saying, "He (or she) is top sawyer," a term often applied, in a complimentary way, by timber-getters to their wives.

Timber-felling has its excitements and, to the uninitiated, its dangers. Experience is as much needed in this as in any other branch of work. We have to bear in mind that "Where a tree falleth, there shall it lie," and it may *not* be in the place in which it is wanted. Now, when certain tricks of trade are committed to memory, one can cause a tree to fall in almost any direction or position. The axeman is then master of the situation. But if he is labouring in ignorance of these tricks the opposite is the case, and felling is fraught with danger. Then, beside dangers, the axeman has to contend against difficulties which, to obviate, tax his ingenuity and resource. Perhaps the greatest and, at the same time, the most common difficulty arises from the peculiarities of certain trees when advanced in life. The giants amongst the "gum" tribe—those hoar with age—are very gnarled just above the ground. The butts, in fact, are one mass of excrescences, and woody growths which form "pockets." These make the tree bell-shaped at the base, and to fell it from the ground entails unnecessary labour. A rough staging, high enough to lift the axeman above the pockets, is made; or, if there are many trees to bring down, the axeman carries with him a "stool," which consists of a heavy flat piece of wood having holes at each end. Long thin sticks are thrust into these holes, giving to the board the appearance of an ordinary four-legged stool mounted on stilts. This is placed against a tree, stayed with a forked stick, and the axeman, mounted on his spider-like rostrum, swings his axe some ten or fifteen feet above the level of the soil, and out of reach of the pockets at the butt. This is called "stool felling."

When the tree, like a prostrated giant, is prone upon the ground, the bark is stripped off, and the crosscut saw is called into requisition to remove the splintered butt and to cut the trunk into lengths. These logs, or sections, are then "snigged," or drawn with a team to a convenient spot, to be loaded on a timber truck.



TIMBER-GETTING.

BLACKALL RANGE.

To facilitate "snigging," a slide (shown in an illustration) is used. It is cut from the fork of a tree. In the space between the two prongs the end of the log rests, and reduces the dead weight by lifting it off the ground. It also helps the log to avoid stumps, stones, and other irregularities of the bush tracks which would otherwise impede progress. Every timber wagon is provided with a "slide"—it is looked upon as an indispensable adjunct—and teamsters take a pride in chopping and shaping a slide which is akin to the fondness a stockman lavishes upon his stockwhip.

The log itself is rolled on to the timber wagon by means of "skids" (shown in illustration) which rest upon the wheels. Two chains are passed round the log, and the log is rolled up the skids by the team, which is made fast to the ends of these chains.

General Notes.

ASPARAGUS.

Up to a very late period it was considered that to grow asparagus successfully it was necessary to dig a deep pit, and fill it full of manure, sowing the seed on the surface. This idea is now completely exploded.

To grow asparagus no such deep bed is necessary. If the bed is well dug or trenched and well manured, this is all that is needed. The seed being sown, it takes three years to bring an asparagus bed into full production, but when that has been done it will continue to produce abundantly for ten or twelve years. If it is a good bed, and prices are satisfactory, it will yield as much as £40 per acre annually. Like all other products of the soil, asparagus has its enemies, and one of them is a yellow worm which has done some little mischief, but there is a new pest in America of a more dangerous kind. Some time ago one of the Bay Farm Island growers imported a quantity of seed, and Horticultural Commissioner Pryal went over to the island recently to warn the people not to plant the seed until after it had been carefully inspected, so that the danger of introducing the pest may be prevented. So far, in Queensland, no pest has troubled the asparagus beds; but whilst every precaution is being taken against the introduction of insects inimical to fruit, it will be well that any insect which affects such a valuable vegetable as the asparagus should be carefully watched.

IMPORTING A CODLIN MOTH EATING BIRD.

FROM the *Pacific Rural Press* we take the following interesting note on "A Codlin Moth Eating Bird." We have ourselves observed and caught the same bird in Switzerland. There is no doubt that it is a bird absolutely insectivorous, and its introduction into Australia would, we feel assured, be a boon to fruitgrowers, horticulturists, and others. We commend the note on this bird to the Acclimatisation Society:—

Mr. Henry E. Desch, commissioner of the Oregon Board of Horticulture, is hard at work, according to the *Oregon Agriculturist*, making arrangements for the importation of the kohlmeise, the bird which keeps down the codlin moth in Germany. He will in a few days have a letter from Germany, informing him of the cost of the birds. He will himself undertake the collection of money in Portland and elsewhere in his district, and expects that each of the other members of the Board of Horticulture will collect funds in his district. The birds will be distributed to the several localities in the State in proportion to the amount of money contributed towards their purchase.

What a Bird Authority Says.—Mr. C. F. Pfluger, a well-known authority on birds, says that the kohlmeise is one of the most strictly insectivorous birds ever known. It is extremely prolific. There are from two or three broods a year, and from ten to twelve birds in a brood. It is not a migratory bird, but remains in the same locality winter and summer. The winters in Germany are more severe than in Oregon, and there is no reason why it should not thrive here. If introduced, it may be expected to multiply even more rapidly than the Chinese pheasant.

The kohlmeise is a bird of about the same size as the chickadee, and is extremely active. The head is black, with white cheeks. Breast is yellow, with black stripe in front; back, olive-green; wings, greyish. The Latin name of this bird is *Parus major*.

There is another closely allied bird named blaumeise (*Parus cœruleus*), which is almost equally valuable as an insect-destroyer. It has a blue head with yellow cheeks, yellow breast, light-blue wings and tail. With this variety Mr. Dosch was familiar in Germany, and well remembered seeing the birds running up and down the trunks and limbs of trees and picking off the insects.

The bird observed by Commissioner Schanno in his district has been identified by Mr. Pfluger as the chickadee or black-headed titmouse (*Parus atricapillus*). It is related to the kohlmeise and blaumeise, but is not the same.

While the primary object of importing the kohlmeise will be to secure a vigilant foe of the larvæ of the codlin moth, yet they will probably prove of great value in destroying other insects. It is reported to feed on certain scale insects in Germany, and Commissioner Dosch hopes that it will acquire a taste for the San José scale.

DANGER OF A SERIOUS PEST FROM CHILI.

MR. A. P. HAYNE, Professor of the University College of California, Berkeley, writes as follows to the *Pacific Rural Press* :—

Among the many insect pests that threaten viticulture and horticulture, I wish to call attention to one that has of late assumed alarming importance. I refer to the Root Scale of Chili, or "Chilian Scale." This new scale attacks the roots not only of the grape vine, but also those of a number of other plants. It would seem to be as dangerous as the Phylloxera on the vine or the Cottony Cushion Scale on fruit trees and other plants. This insect was first mentioned about twelve years ago as being found in Chili. Since then it has spread to several countries of South America, and is considered as a most dangerous pest. I am indebted to my former professor, M. Valery-Mayet, Professor of Entomology at the National School of Agriculture of Montpellier, France, for the most complete description thus far given of it.

The learned professor tells us that its scientific name is *Margarodes vitium*. It is a scale insect, intermediate between a Mealy Bug and a Cottony Cushion Scale, which lives on the roots of the plant. Its dangerous characteristics seem to lie in the fact that, unlike the Cottony Cushion Scale, it lives altogether underground, and thus defies the usual insecticides, vedalia, &c. It closely resembles the Cottony Cushion Scale in appearance, having the same white cottony covering, which defies most insecticide washes from its impermeability. It poisons the root in sucking the sap and speedily causes swellings, just as the Phylloxera does. These swellings soon develop into cancers, which destroy the root system, in spite of the efforts the vine makes to throw out new roots. Thus far no effective remedy has been noted, and foreign countries are endeavouring to protect themselves from it by means of strict quarantine against all South American plants.

State Quarantine Officer Alexander Craw has been notified, and is on the lookout for all plants that may come in by steamer from suspected districts; but he is powerless to help us against those who receive plants by mail or Wells-Fargo's express.

We have Phylloxera, and we have had about all the trouble we want with the Cottony Cushion Scale. Let us be on our guard against something that seems to be a combination of the two.

RECORD CROP OF ONIONS.

A FAMOUS field of onions in San Luis Obispo county (California) produced 65,005 lb. onions per acre, or nearly 29 tons per acre. We stated in last month's *Journal* that 8 tons per acre would leave a handsome profit at £6 per ton. Such a return as recorded would at the same price give the farmer a cheque for £174 per acre. Onions will, with careful cultivation, give quite as

large a yield as that of San Luis. A few months ago a storekeeper said he would give £8 per ton for onions. How is it that farmers who have land suitable for the production of onions do not go in more largely for their cultivation? There is money in it.

ERADICATION OF NUT-GRASS.

THE *Sugar Journal* of 15th February republishes an article from the *Clarence River Advocate* on the destruction of nut-grass, which is worthy of general attention. Nut-grass is rampant on nearly all the scrub lands of the Albert, Logan, and other rivers of the Moreton district, and any proved method of destroying it should be hailed as a boon by the farmers whose lands are unfortunately infested by this pest.

The article we refer to says:—At a meeting of the Hunter River Agricultural Association some discussion took place (says the *Clarence River Advocate*) on the eradication of this pest. Mr. Scobie said he had had 3 acres of vines very bad with it, and now scarcely a plant could be seen. Where it was in the open and could be got at, they simply ploughed the grounds in the winter, and as soon as any showed life they kept the scarifier at work with the knives 3 or 4 inches below the soil. If the ground got hard they gave it another ploughing. That was done for two years, and at the end of that time the greater portion of the nuts were dead. If any did appear, they got a careful man to go over the ground, and, if any appeared, to follow the plant down and dig the nut up. The land was thoroughly cleaned of the pest in two years. Mr. Bishop said he knew a gentleman who had a 5-acre paddock covered with nut-grass. He sowed it thickly with imphee, and killed every piece of it. The imphee smothered it; but it took five years to do so.

POTATO-DRYING.

THE Puyallup *Citizen* describes the method followed by Stevenson and Bartholomew, of Puyallup, Wash., in preparing evaporated potatoes for the Alaska trade, as follows:—

The potatoes are placed in a sieve tank and thoroughly washed with a hose. They are then placed in a steamer for cooking. When cooked they are carried to a corps of women who peel them. They are placed in a box and squeezed by a press through small holes in a steel plate upon sieves which fit like drawers in a kiln. Here they are dried until they are crisp and white. Then for the purpose of reducing the bulk they are ground into meal and sewed into canvas sacks, and are ready for the market. The onions are peeled, sliced through a Pine root-cutter, and spread upon the sieves. When dry they are white as snow, and when cooked become as savoury as fresh onions. While the evaporating company have very successfully dried sweet corn, sweet potatoes, Hubbard squash, fruits, &c., they find that they have enough to do to supply the demand for potatoes and onions.

The potatoes are packed in 25-lb. 8-oz. ducking sacks of the size of 50-lb. flour sacks. The onions are packed in 1, 2, 5, and 10 lb. cans.

It takes three hours to dry onions or potatoes. It takes 7 lb. of green potatoes to make 1 lb. of dried potatoes, and 10 lb. of green onions to produce 1 lb. of the preserved article.

HOW SILOS OPERATE.

THE principle of the silo can be readily understood, if it is compared to an immense can of fruit, filled solidly full to the top and sealed securely with a heavy coat of mould like the old-fashioned mode of keeping preserves in open-top jars. The changes undergone by the food in a silo are caused by the useful bacteria absorbing oxygen and forming carbonic acid, the starch being rapidly converted into sugar. If the food in the silo has been properly tramped in and not too wet or not too dry, the temperature will rapidly rise to

150 degrees, when these fermenting bacteria are destroyed, and the breaking down of the starch into lactic and acetic acid is promptly arrested. The silage resulting is sweet and good. But if the material is improperly packed, or the silo not air-tight, or the fodder not matured, sufficient heat will not be developed to destroy the bacteria, and their continued working on the nitrogenous portions of the silage end by producing amides and ammonia. The result will be poor and sour silage. The milk produced will have a taint similar to that of brewers' slops. This was a few years ago the cause of much complaint, and some condensaries refused to buy milk from farmers using ensilage. Happily, the cause of the trouble being found proves the necessity of carefulness. The cows, it seems, will eat sweet or sour silage with equal readiness.

The Silage Ration.—If the owner of a cow has not her welfare enough at heart to spend time in discovering her needs, he will never learn that his cows are individuals with feeling and peculiarities to be consulted. A patient study of rations and dairy form will give him a first-class herd, and with it will grow affection for the gentle-eyed cow.

Forty pounds seems to be established as about the correct amount of silage a cow will consume daily, provided her other food is balanced to support her bodily needs. It is poor policy to ever allow a heavy-milking cow to grow weak and thin, for if she is not permanently injured she will give considerably less milk the next year as a balancing compensation, while she regains her own vigour. Underfeeding is certain to bring sickly, stunted calves.—*Pacific Rural Press.*

GROWING WATERCRESS.

IN 1895 the *Revue Horticole* published an article on cultivating watercress in a town house without the aid of running water, but in this case repeated waterings from a moat took the place of the usual stream. Brother Antonis, of the Beauvais Institute, has, however, just communicated to the Syndical Chamber of the Market Gardeners, of Amiens, a method of growing watercress both on ordinary soil and on forcing-beds, as, says he, "Everyone has not always running water at command, and it is a mistake to believe that it is actually necessary." To cultivate on ordinary soil, take in spring time some well-turned mould from an old forcing-bed, and spread it on a suitable place to the depth of about 6 inches, smooth and water the same evening, finishing next day by reducing the soil to a very fine tilth. The seed should then be mixed with some fine sand, and sown as evenly as possible on the prepared plot, the seed being covered in with a thin layer of mould; next press down, water, cover with garden matting; when the seed has sprouted, replace the matting with some branches in order to restrain the action of the sun, and water lightly in case of dryness. The young plants soon grow; by-and-by they flower, when a new covering of mould is given them, leaving the plants appearing about 1 inch above ground. The part above ground should then be well freed from soil, and a good watering given. Ten days later shoots begin to spring from the roots, which, on attaining 2 inches or 3 inches in length, are detached from the parent root and pricked in in rows, about 3 inches or 4 inches apart, on an old bed which has been well dug. A fortnight later the cress attains a length of about 6 inches, when cropping should commence, which may be continued, say fortnightly, until frosts set in. It is indispensable to give copious waterings in the evening.

[Watercress grows to perfection on the Darling Downs, and may be seen growing in still water at Toowoomba. Spring Bluff, on the Main Range, is celebrated for its excellent watercresses. In the gullies below the Range at Toowoomba quantities of excellent cress are to be seen growing in the clear pools.—Ed. *Q.A.J.*]

THE LARGEST WINE TANK.

THE largest wine tank in the world has been constructed at Osti, Sonoma County, California. It holds 500,000 gallons of grape juice.

THE RABBIT PEST.

A CORRESPONDENT in Ceylon, writing on the above subject, says:—

The subject of the rabbit pest in Australia has engaged my attention for some time, and it has to be observed how it is that the rabbit multiplies so vastly in Australia and adjacent countries, whereas in other parts of the world it has not run wild to that extent. On reference to a certain work on geography, I have gathered that the carnivorous animals of Australia are very few, both in numbers and variety, compared to the other parts of the world. This, if true, is the root of the whole evil. It is not to be wondered at that an animal of such marvellous powers of fecundity has arrived at such numbers if it has been in the land without a sufficient number of enemies. The human race too, we are told, would ere this have overcrowded the earth were it not for the agencies of devastation. But a race of wild animals cannot be destroyed by the sword, famine, or pestilence. The attempt of M. Pasteur to do that has failed so far. One species should be kept in check by another, lest they overrun the earth. The kangaroo, too, has threatened to jostle the farmer and his sheep out of the land since the disappearance of the dingoes. The remedy for the rabbit pest lies in the introduction of such animals as will prey on them and hold them in check. That is the law of nature.

I do not know what animals have operated against the increase of rabbits in other parts of the world. But in Ceylon I think it is the jackal, and perhaps some others too. Were it not for the jackal, there would very likely have been a rabbit pest in Ceylon too—to say nothing of other countries. And I venture to say that if the jackal—an animal known to go about hunting in packs at night (*vide* Funk and Wagnall's Standard Dictionary)—can be acclimatised in Australia, the cessation of this pest will only be a matter of course, along with the increase of the jackals.

[Our correspondent does not appear to be very well posted up in the question of rabbits, dingoes, and kangaroos.

The former are undoubtedly in evidence in Queensland, but are kept very much in check by extensive rabbit-fencing, and by the chicken-cholera introduced by Mr. C. J. Pound, F.R.M.S., Director of the Stock Institute. This remedy is one that must eventually exterminate bunny, if properly and persistently applied. As to dingoes they are very far from having disappeared, notwithstanding the reward of 10s. per head for their destruction. Kangaroos are no longer heard of as such dire pests as in former years when thousands were destroyed in the West at periodical *battues*. The kangaroo's hide has an established market value, and shooters find their work none too easy, now that the kangaroo has become scarcer. Wallabies of various kinds are a far greater pest. With respect to the introduction of the jackal into Australia for the purpose of rabbit-destruction, anyone with a knowledge of the habits of these noctambular carnivores would smile at the idea. The jackal is not particular as to its food, and sheep, lambs, and calves would have a lively time of it with the brutes. Besides this, they are occasionally dangerous to human life.—Ed. *Q.A.J.*]

A NEW VARIETY OF OATS.

MR. W. MARTIN, of Welbar, Drouin, is making a practical test of a new variety of oats, the "Surprise" (states an exchange). The name is certainly appropriate, as from present indications it will be a prolific cropper. The crop stands almost if not quite 7 feet high, and the stalks are of corresponding strength. Competent judges declare that the yield cannot be less than 70 or

90 bushels per acre. It was planted on soil prepared in the usual way, with a dressing of 2 cwt. of Thomas' phosphate per acre, and the crop covers one acre and a-half. The ordinary oat crop was sown early in May, and the "Surprise" early in June, and yet, though the new variety was put in a month later, it is already developing into ear, whereas the other is 4 feet 6 inches high, and the ear not yet showing. The fact that the "Surprise" matures more rapidly is a strong point in its favour. The new oat was discovered in California, where it yields 70 bushels to the acre, almost double that of the other sorts. Mr. Martin is delighted with the results of his experiment, and it is his present intention to sow the new grain exclusively next season. His surplus seed is already bespoken at 10s. per bushel.—*Stock and Station Journal*.

A NEW WAY OF PRESERVING MILK.

THE following comes from an American paper, and we give it for what it is worth:—"John Russell, of Seattle, Washington, is said to have discovered a process for preserving milk that will stagger the condensed milk people. Some samples have been kept for a year, and the milk has proved as fresh as when 'put up.' It is not 'condensed,' nor is it preserved by the use of any additional preservative. It is, however, subjected to a process known only to the discoverer. Milk and cream are both prepared in the same way, and have the same taste, appearance, and properties of the fresh article. Samples have been submitted to Dr. Spencer, the well-known bacteriologist, who is reported as having enthusiastically endorsed the milk as being pure and healthful. A factory has been erected, and the preserved milk is now being used in San Francisco, California. The possibilities of the discovery are described as being enormous; and while it may injure the business of the milkman near the large cities, it will be of the greatest benefit to the more remote dairies and the consumers. At Point Reyes, where the parent factory is located, farmers are offered 25 per cent. more for their milk than they could make by turning it into butter. The new process takes milk out of the list of perishable articles, and it is said that so cheap is the process that it can be practically sold at the same price as fresh milk. A family can get a dozen bottles, or a hundred for that matter, and keep them on hand ready to use at any time. It is expected that grocers will keep it on hand also, just as they do canned tomatoes or corn, as it can be handled just as safely and easily.—*Agricultural Gazette*, Tasmania.

HOW TO MEASURE CORN IN CRIB.

THE following rule will apply to a crib of any kind:—Two cubic feet of sound, dry corn in the ear will make a bushel shelled. To get the quantity of shelled corn in a crib of corn in the ear, measure the length, breadth, and height of the crib inside of the rail. Multiply the length by the breadth, and the product by the height. Then divide the product by 2, and you have the number of bushels in the crib.

EXAMPLE.

Your crib or barn is 20 feet long, 10 feet broad, and 8 feet high. This is packed with husked corn.

$$20 \times 10 \times 8 = 1,600 \text{ cubic feet.}$$

Divide by 2, and you get 800, the number of bushels of shelled grain in your barn.

To calculate the number of bushels of potatoes in a pit or bin, multiply the length, breadth, and depth of the pit or bin together, and divide by 8.

To find the quantity of hay in a stack, make the same multiplications and allow 512 cubic feet to the ton. That is, divide by 512 to obtain the number of tons in the stack.

TO CLEAN STRAW HATS.

STRAW hats are so commonly worn in Queensland, and they suffer so much from the summer sun, that it may not be amiss, for the sake of those who live outside the realm of the "cleaner" to give the following recipe for the renovation of the straw:—The tan of a season's wear will vanish before a stiff old toothbrush dipped in lemon juice and flower of sulphur. The whole must be thoroughly gone over, and the result will be very satisfactory.

TO MAKE CHEESE BALLS.

CHOP half-a-pound of good cheese; add to it one pint of soft breadcrumbs, a dash of cayenne, a teaspoonful of salt, mix, and add two eggs unbeaten. Form into balls the size of an English walnut. Dip in beaten egg, then in crumbs, and fry in smoking-hot fat.

PICKLING CUCUMBERS.

WHEN pickling cucumbers, the addition of horse-radish to the vinegar helps to retain the strength in the vinegar, and prevents the formation of mould on the top of the liquid. Lay horse-radish leaves over the top of the vinegar.

KROMESKYS.

THOUGH not a common dish, kromeskys are by no means difficult to make, and, as most of the ingredients required are generally to be found in a farmhouse larder, there is no reason why the dainty should not occasionally vary the bill of fare on the farmer's breakfast table. A kromesky is simply a spoonful of carefully prepared mincemeat (savoury, of course), wrapped in a slice of cold boiled bacon, then dipped in batter and fried. Mince very finely a small quantity of cold mutton or any underdone meat that may happen to be at hand. Fry in butter, to a pale straw colour, some shallots or an onion finely minced; put in the meat, give it a turn or two, and moisten with a little good gravy or stock; add spices, a dash of cayenne pepper, a squeeze of lemon, a pinch of minced parsley, and salt to taste; let the whole reduce a little, and put it aside to cool. Cut some slices of boiled bacon as thin as possible to the size of about an inch and a-half or two and a-half inches; place on each slice a dessert-spoonful of the mince, and roll it up in the bacon very neatly; keep the kromeskys in a cool place till the time of frying them; then dip them in batter and lay them in the frying-pan, taking care they do not come unrolled. The batter may be made thus: 4 oz. flour, $\frac{1}{4}$ -pint warm water, and, if not objected to, a good tablespoonful of olive oil; before using stir in the whites of two eggs, beaten to a stiff froth. The frying fat should be thoroughly hot before the kromeskys are put in, so as to crisp them at once on the outside; and too many should not be put in at once, so as not to chill the fat.

AGRICULTURAL AND HORTICULTURAL SHOWS.

THE Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

LIST OF AGRICULTURAL AND HORTICULTURAL SOCIETIES AND ASSOCIATIONS IN QUEENSLAND.

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Allora ...	Central Downs Agricultural and Horticultural Association	J. H. Buxton...	6 May
Beaudesert ...	Logan and Albert Pastoral and Agricultural Society	M. Hinchcliffe ...	
Beenleigh ...	Agricultural and Pastoral Society of Southern Queensland	Wilson Holliday ...	
Blackall ...	Barcoo Pastoral Society	F. Clewett ...	28 April
Boonah ...	Fassifern and Dugandan Agricultural and Pastoral Association	J. A. McBean ...	
Bowen ...	Bowen Farmers' Club	J. B. Thuman ...	
Bowen ...	Pastoral, Agricultural, and Mining Society ...	J. E. Smith ...	21 and 22 April
Bowen ...	Preston Farmers' Association	R. A. Foulger ...	
Bowen ...	Proserpine Farmers' and Settlers' Association		
Brisbane ...	Horticultural Society of Queensland	G. K. Seabrook ...	
Brisbane ...	Moreton Agricultural, Horticultural, and Industrial Association	J. Duffield ...	
Brisbane ...	Queensland Acclimatisation Society	E. Grimley ...	
Brisbane ...	Queensland Fruit and Economic Plant Growers' Association	G. K. Seabrook ...	
Brisbane ...	Queensland National Agricultural and Industrial Association	H. C. Wood ...	
Brisbane ...	Queensland Stockbreeders' and Graziers' Association	F. A. Blackman ..	
Brisbane ...	United Pastoralists' Association	Fredk. Ranson ..	
Bundaberg ...	Bundaberg Agricultural and Pastoral Society	A. McIntosh ...	
Bundaberg ...	Bundaberg Horticultural Association	H. E. Ashley...	
Bundaberg ...	Woongarra Canegrowers' and Farmers' Association	H. Cattermull ...	
Burpengary...	Burpengary Farmers' Association	D. J. Collins ...	
Caboolture ...	Caboolture Farmers' Association	G. Mallet ...	
Cairns ...	Barron Valley Farmers' Association		
Cairns ...	Cairns Agricultural, Pastoral, and Mining Association	A. J. Draper ...	
Charleville ...	Central Warrego Pastoral and Agricultural Association	A. J. Carter ...	
Charters Towers	Towers Pastoral, Agricultural, and Mining Association	W. Tilley ...	
Clermont ...	Peak Downs Pastoral, Horticultural, and Agricultural Society	F. Leysley ...	
Cooktown ...	Cook District Pastoral and Agricultural Society	W. R. Humphreys ...	
Cunnamulla ...	South Warrego Pastoral Association	J. Winward ...	
Gayndah ...	Gayndah Agricultural and Horticultural Association	J. C. Kerr ...	
Gin Gin ...	Pastoral and Agricultural Society of Gin Gin	E. K. Wollen ...	
Gladstone ...	Gladstone Pastoral and Agricultural Association	W. J. Manning ...	
Gooburrum, Bundaberg	Gooburrum Farmers' and Canegrowers' Association	W. J. Tutin ...	
Goondiwindi	MacIntyre River Pastoral and Agricultural Society	A. Gough ...	
Gympie ...	Agricultural, Mining, and Pastoral Society	F. Vaughan ...	
Gympie ...	Gympie Horticultural Society	W. G. Ambrose ...	
Helidon ...	Helidon Scrub Farmers' Association	J. C. Collins ...	
Herbert River	Halifax Planters' Club	H. G. Faithful ...	
Herbert River	Macnade Farmers' Association... ..	E. C. Biggs ...	
Herbert River	Ripple Creek Farmers' Association	J. W. Grimes ...	
Herberton ...	Mining, Pastoral, and Agricultural Association	John M. Hollway ...	11 and 12 April
Horton ...	South Isis Planters' and Farmers' Association	H. Epps ...	
Hughenden...	Hughenden Pastoral and Agricultural Association	W. H. Mulligan ...	10 and 11 May
Ingham ...	Herbert River Farmers' Association		
Ingham ...	Herbert River Pastoral and Agricultural Association	Bryan Lynn ...	
Ipswich ...	Ipswich and West Moreton Agricultural and Horticultural Society	P. W. Cameron ...	
Ipswich ...	Queensland Pastoral and Agricultural Society	Elias Harding ...	
Kandanga (near Gympie)	Kandanga Farmers' Association	N. Rasmussen ...	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Kolan ...	Kolan Canegrowers' and Farmers' Association	C. Marks ...	27 and 28 July
Laidley ...	Lockyer Agricultural and Industrial Society	John Fielding ...	
Loganholme..	Logan Farmers' and Industrial Association ...	F. W. Peek ...	12 April
Longreach ...	Marathon District Pastoral and Mining Society	Neil McPhie ...	
Lucinda	Victoria Farmers' Association ...	W. S. C. Warren ...	27, 28, and 29 July
Point	Agricultural, Pastoral, and Mining Association	F. Black ...	
Mackay ..		E. Swayne ...	
Mackay ...	Pioneer River Farmers' Association ...	H. A. Jones ...	
Maryborough	Maryborough Horticultural Society ...	G. Willey ...	
Maryborough	Wide Bay and Burnett Pastoral and Agricultural Society	T. R. Garrick ...	
Milbong ...	Milbong Farmers' Association ...	H. J. Corbett ...	10 and 11 May
Mitchell ...	Mitchell and Maranoa Pastoral, Agricultural, and Vinegrowers' Association	..	
Mosman	Mosman River Farmers' Association ...	..	
River	Mount Mee Farmers' Association ...	R. Thomas ...	
Mount Mee...		W. J. Browne ...	
Nerang ...	South Queensland and Border Pastoral and Agricultural Society	W. J. Young ...	
North Isis ...	North Isis Canegrowers' Association ...	J. B. Stephens ...	
Pialba ...	Pialba Farmers' Association ...	T. Whitely, Coowonga	
Rockhampton	Central Queensland Farmers' and Selectors' Association	G. Mackay ...	
Rockhampton	Central Queensland Pastoral Employers' Association	R. R. Dawbarn ...	
Rockhampton	Rockhampton Agricultural Society ...	H. K. Alford ...	2, 3, and 4 Aug.
Roma ...	Western Queensland Pastoral and Agricultural Association	F. E. Glazier... ..	
Roma ...	Yingerbay Farmers' Association ...	P. H. Adams... ..	
Rosewood ...	Farmers' Club ...	G. R. Milliken ...	
Springsure ...	Queensland Pastoral Society ...	Geo. Simcocks ...	
Stanthorpe ...	Border Agricultural, Pastoral, and Mining Society	Jas. Scully ...	
Stanthorpe ...	Stanthorpe Horticultural and Viticultural Society	T. M. Cummings ...	4 June
St. George ...	Balonne Pastoral and Agricultural Association	H. Hopkins ...	
Toowoomba	Darling Downs Horticultural Association ...	H. Symes ...	
Toowoomba	Drayton and Toowoomba Agricultural and Horticultural Society	F. Buatt ...	
Toowoomba	Royal Agricultural Society of Queensland ...	J. N. Parkes ..	4 June
Townsville ...	Townsville Pastoral, Agricultural, and Industrial Association (formerly North Queensland Pastoral and Agricultural Association)	P. W. Howse ...	
Wallumbilla	Wallumbilla Farmers' Association ...	J. Selke ...	4 June
Warwick ...	Eastern Downs Horticultural and Agricultural Association	G. Burnett ...	
Wellington	Wellington Point Agricultural, Horticultural, and Industrial Association	J. Harvey ...	4 June
Point	Woombye Fruitgrowers' Association ...	H. B. Griffiths ...	
Woombye ...	Woombye Progress Association ...	..	4 June
Woowoonga	Degilbo Progress Association ...	..	
Woowoonga	Woowoonga Scrub Farmers' Association ...	..	

The Markets.

AVERAGE PRICES FOR FEBRUARY.

Article.								FEBRUARY.		
								Top Prices.		
								£	s.	d.
Bacon	...	...	...	...	...	...	lb.	0	0	7
Bran	...	...	...	...	...	...	ton	3	8	1 $\frac{1}{2}$
Butter, First	...	...	...	...	...	...	lb.	0	0	7 $\frac{5}{16}$
Butter, Second	...	...	...	...	...	...	,,	0	0	4 $\frac{1}{4}$
Chaff, Mixed	...	...	...	...	...	...	ton	3	6	3
Chaff, Oaten	...	...	...	...	...	...	,,	4	0	0
Chaff, Lucerne	...	...	...	...	...	...	,,	3	0	0
Chaff, Wheaten	...	...	...	...	...	...	,,	2	17	6
Cheese	...	...	...	...	...	...	lb.	0	0	5
Flour	...	...	...	...	...	...	ton	14	10	0
Hay, Oaten	...	...	...	...	...	...	,,	3	10	0
Hay, Lucerne	...	...	...	...	...	...	,,	2	0	0
Honey	...	...	...	...	...	...	lb.	0	0	1 $\frac{1}{2}$
Japan Rice, Bond	...	...	...	...	...	...	ton	16	0	0
Maize	...	...	...	...	...	...	bus.	0	3	4 $\frac{3}{4}$
Oats	...	...	...	...	...	...	,,	0	3	6
Pollard	...	...	...	...	...	...	ton	4	8	9
Potatoes	...	...	...	...	...	...	,,	8	17	6
Potatoes, Sweet	...	...	...	...	...	...	,,	3	10	0
Pumpkins	...	...	...	...	...	...	,,	2	5	0
Sugar, White	...	...	...	...	...	...	,,	15	10	0
Sugar, Yellow	...	...	...	...	...	...	,,	13	10	0
Sugar, Ration	...	...	...	...	...	...	,,	11	12	6
Wheat	...	...	...	...	...	...	bus.	0	4	9
Onions	...	...	...	...	...	...	cwt.	0	7	11 $\frac{1}{4}$
Hams	...	...	...	...	...	...	lb.	0	0	9
Eggs	...	...	...	...	...	...	doz.	0	0	10 $\frac{1}{8}$
Fowls	...	...	...	...	...	...	pair	0	2	9
Geese	...	...	...	...	...	...	,,	0	5	0
Ducks, English	...	...	...	...	...	...	,,	0	2	8 $\frac{1}{4}$
Ducks, Muscovy	...	...	...	...	...	...	,,	0	2	11 $\frac{1}{4}$
Turkeys, Hens	...	...	...	...	...	...	,,	0	5	7 $\frac{1}{2}$
Turkeys, Gobblers	...	...	...	...	...	...	,,	0	10	0

Farm and Garden Notes for April.

Farm.—Maize should now all be got in. Gather sorghum seed as it ripens. Cotton will now be coming into pod, and will require attention. Cut and house tobacco as it comes to maturity. Sow lucerne, vetches, oats, barley, rye, wheat, mangolds, and Swede turnips. Earth up potatoes.

Kitchen Garden.—Hoe continually among the crops to keep them clean, having beds well dug and manured as recommended last month for transplanting the various vegetables now coming on. Thin out all crops that are overcrowded. Divide and plant out pot herbs, giving a little water if required until established. Sow broad beans, peas, onions, radish, mustard, cress, tree and potato onions, or the same as in March. Early celery should be earthed up in dry weather. Go carefully over the plants with your hands to prevent the loose soil getting between the leaves, one hand holding up the leaves, the other earthing round each plant. Fill up occasionally, and your celery will be ready in about two months. Transplant cabbages and cauliflowers.

Flower Garden.—The operations this month will depend greatly on the weather. If wet, both planting and transplanting may be done at once, as there is some chance of getting them established before the winter sets in. Camellias, gardenias, &c., may be removed with safety. Plant out all soft-wooded plants, such as verbenas, petunias, penstemons, &c. Cut away all dead branches, hoe all borders, and stake plants that may require it. Plant bulbs, and mark them with a stick so as not to destroy them in hoeing or digging. Sow annuals, as carnations, pansy, mignonette, daisy, snapdragon, dianthus, stock, candytuft, phlox, sweet peas, &c. Plant bulbs same as in March.

Cultural Notes for Tropical Queensland.

[The Cultural Notes for Tropical Queensland, kindly supplied by Mr. E. Cowley, Kamerunga State Nursery, are given a month in advance, for the obvious reason that the *Journal* cannot reach some parts of the far North until the month of issue is well-nigh over, and hence the monthly notes would be valueless until the following year.]

MAY.

ENDEAVOUR to keep weeds down; continue trashing sugar-cane; commence picking coffee; tobacco should now be well up, keep a good lookout for insect pests, and transplant into the field. Plantings of peas, English potatoes, French beans, lettuce, turnips, and carrots may be made in cool sheltered spots; those with good soil should be chosen. Supplies of *Solanum ovigerum* (egg fruit) should be obtainable. Planting of coffee seed in prepared nurseries may be commenced. Plant *Papaver somniferum* (opium poppy), using plenty of pigsty manure. Cold nights may now be looked for, the minimum temperature at times reaching 54 degrees Fahr. The leaves of some of the earlier varieties of tobacco may be gathered. Seed of teosinte may be gathered. Kohl rabi does well if planted this month; plantings of cow pea can also be made. Seeds of *Spondias dulcis* may be planted. Extract the fibre from *Hibiscus sabdarifera*. Plough in cow pea. This is the orange season of the tropics. The weather is sometimes too hot for temperate zone vegetables, and great care is necessary. Sometimes the cow pea does not seem to thrive this month. Egyptian wheat may be planted. Oats may be sown, and a fair crop obtained for green fodder if favourable weather ensues. Water vegetables with dilute kainit. Pods will be developing on *Theobroma cacao*. Commence distribution of coffee seed.

Orchard Notes for April.

By ALBERT H. BENSON.

CITRUS are undoubtedly the fruits of the month, especially in the Maryborough and Northern coastal districts of the colony, so that a few words on their gathering, handling, and packing may not be altogether out of place, as the success or failure of an orchard depends quite as much on the careful handling and packing of the fruit as on any other orchard operations throughout the year.

In the first place, too great care cannot be exercised in the gathering of the fruit so as to prevent injury from bruising or otherwise, as a bruised fruit is always a spoilt fruit and will not carry. All citrus fruits, especially mandarins and lemons, should be cut instead of being pulled from the trees, clippers made for the purpose being used. In pulling citrus fruits you are apt to injure the fruit; the skin at the stem end being either lifted or entirely pulled out (plugged), which causes the fruit to decay from this spot, and this cause of loss is entirely obviated when the fruit is carefully cut. When cut, the fruit should be gently handled so as to prevent any bruising, and should be placed in cases to sweat, so as to toughen the skin and render it less liable to injury when packed. When sweated, the fruit should be graded to size, and then firmly packed into the cases in which it is to be marketed or exported. Ordinary fruit, if firmly packed, will not need wrapping for intercolonial trade; but all fruit for export, and also extra quality fruit for intercolonial trade, will pay to be wrapped in good-quality, tough tissue-paper. Careful gathering, handling, grading, and packing are the secrets of success in marketing citrus fruits; close attention to same will result in a profit to the shipper, and neglect will mean failure.

During the month the orchard should be kept thoroughly cultivated, and where not already done should be got into proper shape after the summer rains so as to be ready for the winter work. New land to be set out to orchard should be got into order, as it is advisable to start early in order to get the land thoroughly pulverised and sweetened before planting the trees.

Insect and fungus pests should be fought wherever and whenever found, and all fruits, citrus especially, that are exported from the colony, should be cleaned from all scale or other insects infesting them. These remarks apply not only to citrus fruits but also to bananas, pineapples, custard apples, &c., as no fruits should be exported from Queensland unless they are free from disease of any kind.

Care should be taken to gather and destroy any guavas that may be lying under the trees, as these fruits are the breeding-grounds of the fruit fly, and if not destroyed are the medium of carrying this great fruit pest over from one season to another, so that it is impossible to devote too great care to the destruction of all fallen guavas or other fruits during the autumn, as by carefully attending to this the crop of fruit flies for the succeeding season will be materially diminished.

Plate XXIV.



COLLECTION OF MARROWS AND SQUASHES GROWN AT WESTBROOK.

Co-operation Again.

WE have frequently drawn attention to the advantages farmers would derive from co-operating to obtain their implements, machinery, and general supplies. Every agricultural paper all over the colonies advises the same thing, and yet farmers seem to be a long way from grasping the idea. Even in the land of co-operation—the United States and Canada—the rural journals are still hammering away at the same subject. This is what the *Winnipeg Weekly Tribune* says about it:—

“During the past summer we printed in these columns a series of articles on the subject of co-operation, in which we showed how much the people of this province needed to bind themselves together to resist the extortionate terms which are charged them for the most of what they buy. We believe that if there was co-operative buying of farm machinery, for instance, there would be saved to the farmer 33 per cent., and that 75 dollars would go as far as 100 dollars do now, and we have the evidence to show this is so. The same is true in lumber, and a great many other things that the farmers buy in large quantities.

“Co-operation. The most of the capital of the country is inherent in the farmers, and if they were united they would have unlimited credit.

“The grain crop of '98 should be handled entirely by co-operation amongst the farmers.

“Let this be the subject of deliberation at the farmers' gatherings this month. Surely, there is business acumen enough amongst the farmers to keep themselves from being so unmercifully fleeced.”

Take the case of American ploughs as an example. They can be purchased in Brisbane for 30s.; but, if half-a-dozen are ordered, the price immediately falls to 25s., and even to £1. Thus the farmers become dealers, and get the dealers' profits. Surely any man can see his way to saving 10s., or even 5s., on a single implement; and in a large community of farmers it should not be difficult to find six men who want a plough. It is the same with flour, tea, sugar, sacks, seed, &c. A hundredweight, pound, or dozen are more expensive than a ton or a gross. What is wanted is organisation; and good organisation means a good organiser. There are plenty of such men in our agricultural districts. In days gone by, when seed potatoes arrived in Brisbane in shiploads from New Zealand and Tasmania, a ton was sold at from £10 to £15. A number of farmers combined to take some thirty tons. Their boats lay alongside the ship, and the potatoes were loaded into the farmers' bags at from £6 to £8 per ton—a saving of over £120, divided amongst ten men. What has been done can be done again. Why should every man lose perhaps a day's work for himself, horse, and dray, and travel ten or fifteen miles to bring home a bag of flour and another of sugar? The same labour, with an extra horse, would carry ten bags of flour, and there would be a saving on taking 2,000 lb. of flour instead of 200 lb. The advantages of combination are so palpable that it seems almost unnecessary to point them out. There are just as smart business men amongst the farmers of Queensland as there are in the merchants' houses of the cities. If these men would take the lead, others would soon be brought to see what large profits can be made by mere saving in cost of supplies. In the “General Notes” in this number of the *Journal* will be found a notice of the successful Co-operative Society of Aspatria (England). We recommend farmers to read it—mark and learn.

Agriculture.

CO-OPERATIVE FLOUR MILLS.

MR. TILLET, of Pittsworth, lately gave a few particulars to Mr. Daniels, M.L.A., about his last season's wheat crop, and especially upon the plan he adopted to obtain a fair price for his wheat. Instead of selling it to the millers, he had it gristed and so turned it into flour, pollard, and bran, with a most satisfactory result. The price offered by the millers in Toowoomba was 3s. 9d. per bushel, the wheat to be kept until it was required by the purchaser. Mr. Tillett thought he could do better, so, as before said, he had the grain gristed, and sold the flour at 1s. per bag less than the miller's price. By so doing, he says that the result was equal to 4s. 6d. per bushel for his wheat, besides which he had the bran and pollard, which, when sold, would realise 5s. per bushel.

In the Pittsworth district some 120,000 bushels of wheat were produced last season. If the figures above quoted are correct, then it follows that the farmers by selling their grain must lose £6,000, whereas, had they had a mill of their own, this loss would have spelt profit. It is quite natural that millers, like all other business-like manufacturers, will try to buy in the cheapest and sell in the dearest market. This is perfectly legitimate trading, but most people who deal in any commodity of universal consumption give their customers the benefit of the cheap buying. Those, therefore, who reap benefit from the transaction are not the producers, but the consumers. In this case, the farmers are the producers, and the middlemen are the gainers—not the public at large, who are the consumers.

Here then we have an argument in favour of the erection of co-operative flour mills. But flour mills, although they may be erected at comparatively small cost are not run without capital. Suppose a mill capable of gristing 200,000 bushels of grain per annum, those 200,000 bushels will have to be purchased for cash, which for argument sake we will put at 4s. per bushel. That means £40,000, but not necessarily a capital of £40,000. The grain is not purchased all at once, or if the year's requirements are provided for in advance, delivery is arranged for at stated intervals and payment made on delivery. Meanwhile sales of flour are being made almost as fast as the grain comes in, so that nothing like the large capital above mentioned would be needed. At the same time the fact must not be lost sight of that new brands of flour have to make their way in the general market against old, well-known, established brands, and hence it might occur that large stocks of flour would be accumulated, and still, to keep the mill going, cash purchases of grain would have to be made and that would mean a large amount of dead capital.

So far we have briefly glanced at the position of private millowners. Now let us see how the matter would stand in the case of a co-operative company.

Here we must first go into figures and try to arrive at an estimate of the cost of machinery, fittings, erection, and buildings.

For a large district where there are 10,000 acres of wheat cut for grain (and such an area in one district is in the near future), a mill would be required capable of gristing 200,000 bushels per annum.

The cost of such a mill would be as follows :—

Compound high-pressure engine and boiler, 40 h.p. ...	£1,500
Rollers, smutting, dusting, cleaning, dressing and elevating machinery	4,000
Erecting machinery	600
Total	£6,100

The duty of 25 per cent. on the engine must be added to the above estimate.

A flour mill of this description would grist seven sacks of flour (280 lb. each, English measure) per hour.

A far cheaper plant, however, and one which would be of great advantage to farmers in many wheat-growing districts is the "Three Sack Plant," that is a mill which will grist about 900 lb. per hour. This can be worked with a 20-h.p. portable engine, costing £500. The grinding machinery, including all necessary appliances, would come to £2,500, to which must be added cost of erection, say, about £300. Freight, carriage, commissions, sundries, &c., will bring the total cost to over £3,600.

In the above estimates we have not taken the buildings or land into consideration, as the land might be obtained gratis in the interests of the district in which a co-operative mill is proposed to be established, whilst, as to the buildings, these must necessarily vary in style according to the conditions of site, foundations, and the length of the shareholders' pockets.

In any case the whole thing would have to be placed in the hands of a competent engineer from start to finish. The fitting up of the milling machinery, however, should be entrusted to those who make a speciality of such work.

A flour mill should not be less than four stories high. This allows for basement, grinding floor, machine floor, garner floor, and over that in the roof which is termed the shooting stage.

We have taken some trouble to ascertain facts in connection with existing flour-mills (privately owned) in order that farmers who intend beginning the gristing business on the co-operative system may have fairly accurate data on which to base their calculations.

In the first place, an analysis of the results of Mr. Tillett's experiment will show that, although that gentleman is satisfied with his returns, it does not follow that all farmers would be equally successful in the direction of gristing their wheat. It takes 52 bushels of wheat to produce 1 ton of 2,000 lb. of flour. At 4s. per bushel this would equal £10 8s. per ton, or, excluding waste, £11 per ton on an average.

Let us put the result in tabular form for convenience of calculation, taking, however, the price of wheat at 3s. 9d. per bushel :—

52 bushels wheat, at 3s. 9d.	£9 15 0
Gristing, at 1s. per bushel	2 12 0
5 extra bags supplied by miller	0 1 8
	12 8 8
1 ton flour (nominal value at mill)	£11 0 0
940 lb. bran and pollard	1 3 6
	12 3 6
	£0 5 2

Here, by gristing his own wheat, the farmer appears to have lost 5s. 2d. Supposing his flour to have sold at £12, the profit would be 14s. 10d. per ton. But everyone knows that wheat is much mixed. It contains oats, barley, perished grain, and dust, which have to be extracted by various processes, thus considerably reducing the weight of good grain in 52 bushels, which it takes to make 1 ton of flour. This loss runs from 2 to 3 lb. per bushel, the result of clearing and grading. Small wheat weakens the flour.

Farmers naturally wish to sell their wheat as soon as possible after harvest, for one reason that they have not always storage room for the grain. Now the miller has to buy it from them, and hence has often immense stocks on hand.

This means the locking up of a large amount of capital, but all millers have to do so more or less. If they could just buy for present requirements they could afford to give a better price for the wheat than if they had to buy great quantities to run the mills right through the year. Some have bought six, seven, and eight months ahead of immediate requirements, and one company had in one year 3,500 sacks of wheat in stock. They had to buy whether they wanted the wheat at the time or not. Farmers sometimes have to sell under pressure of want of means and must get rid of their crop, and where quantities of wheat are rushed into the market at once, prices naturally decline. Then to come to the capital required by a milling company after erection of the buildings and machinery. First, there is the interest on the dead capital sunk in the undertaking. Second, there is a probable rental of premises in which to store grain (if the mill be in a town). Thirdly, insurance. Fourthly, cost of labour for handling and packing grain and flour in the stores. Fifthly, the first and second cartage of grain into the store. Then we have the screening of the new wheat. Further, there is loss owing to mice, rats, and weevils. So that there is considerable expense and risk before any gristing can be done. Then when the flour is made, it is well not to sell it hot from the rollers. The flour-miller who does so courts disaster. Flour must have some age. This improves the quality. It should be kept a month at least in stock before being sent out. These and other working expenses of a mill such as we have described as being equal to coping with 200,000 bushels per annum would amount to £2,500 per annum.

The co-operative mill is a mill with shareholders who are the growers of the wheat, and who supply the mill with grain. They naturally expect their grain to be taken in preference to that of outsiders by their own mill. Many farmers are sometimes entirely in the hands of the storekeepers, and if they cannot sell their wheat, the storekeeper must take it, and make the best bargain he can with the mill-owners, but as he can afford generally to hold it for some time he gets a much better price than he gave for it.

The market for flour, bran, and pollard made on the Downs is Brisbane, the western market being limited, and the freight on wheat to the Brisbane market is 2d. per bushel for lots of 4 tons.

Now what we have tried to point out in this short article is that there is a very considerable expense incurred in the establishment of a first-class mill, and nothing else will do. Small flour-mills will no more pay than small sugar-mills. A large amount of capital is required for labour (about £50 per week). Both

wheat and flour will often have to be stored, interest being lost on the capital so locked up; insurances, freights, &c., &c., all run away with money. So that it is advisable that the most minute information should be gained by any who propose to enter into flour-milling as a co-operative business.

Under the heading "Farmers and Flour-millers," the *Agricultural Gazette* (Tasmania), re-publishes the following article from the *Melbourne Leader* :—

THE WAGGA CO-OPERATIVE MILL.

The great question of co-operation has so far been reduced to a practical system for the benefit of only two classes—the consumers on the one hand, and on the other the business agencies engaged in handling the results of creative energy on their way from the producers to the consumers. That the first and most important class of producers, the tillers of the soil, are the latest to avail themselves of the advantages of co-operation, as well as the most difficult to organise in the way of effective co-operative effort, is mainly due to their exceptional position with respect to the necessarily isolated conditions imposed upon them by the nature of their occupation. Notwithstanding this, however, co-operation among the farmers is now being seriously considered, the first practical start having been made by the wheat-growers of Victoria and Riverina in connection with the disposal of their grain, with the object of diverting from the pockets of a comparatively limited number of non-producing speculators the legitimate profit of their industry into those of the class to which it rightfully belongs. And now the question is being asked by the wheat-growers: If co-operative action loyally carried out between us will be beneficial with respect to the handling of our wheat, why should we not go further, and obtain the increased profits connected with the conversion of the grain into flour? This raises two important points. Is flour-milling profitable, and if so, is flour-milling by co-operative organisation of the producers of the wheat practicable? On the first point it is ascertained that the proprietary flour-millers have constructed for their own guidance, presumably for private circulation, a manufacturing and marketing table, of which a copy has been obtained, and is herewith submitted for public information.

Taking present prices of wheat, bran, and flour at Melbourne as an example, for the purpose of comparing them with the foregoing, it is seen that the millers on their own figures are obtaining profits by a levy alike upon the producer and the consumer. That is to say, the price of wheat at the present moment in Melbourne is 4s. 1d. per bushel, the price of bran and pollard from 9d. to 10d., say 9½d. per bushel as an average, and the price of flour from £11 to £11 15s. per ton, say £11 10s. Subjecting these relative rates to the test of the table, it will be found that the corresponding price of flour should be £9 9s. 4d. per ton, showing an increase of £2 0s. 8d. per ton that the miller is receiving, which it should be further noted is over and above the sums of 20s. per ton for manufacturing, and the 10s. per ton clear profit already provided for within the tabulated price of £9 9s. 4d. per ton for flour. So much for the consumer's side of the question; but then again it will be noted by reference to the table that the present price being received for flour very nearly stands opposite a 5s. a bushel price for wheat. Instead of paying that rate, however, the miller is getting his wheat at 4s. 1d. per bushel, so that while the consumer is on the millers' own showing being charged over £2 per ton extra on his flour, the farmer is being paid 9d. per bushel too little for his wheat. What this amounts to upon a bulk trade may be further illustrated by reference to the milling business of Victoria alone, whose home consumption represents about 105,000 tons of flour annually, or the product of, in round numbers, say, 5,250,000 bushels of wheat. The extra £2 per ton (over and above the 20s. per ton for manufacturing and 10s. per ton clear profit) being paid by the customer on this quantity of flour comes to £210,000, and the

9d. per bushel advantage at the same time being obtained by the Victorian miller at the expense of the farmer upon the wheat amounts to another £196,875, or a total of £406,875. This, on the face of it, all will admit (except, of course, the comparatively few who secure these profits at the expense of the large body of producers and customers alike), disclose a state of things that does not appear to square with equitable commercial conditions. Further, it points to a specially important fact that the farmer, in his consideration of the co-operative question, will have to take particularly into account—that is, that the miller is not merely a converter of wheat into flour, but in addition, is always a wheat speculator as well. Wheat gives only one crop a year, but the average farmer under present disorganised conditions has to get rid of an article within a month or two after harvest that takes him all the year to produce. Here and there are to be found exceptional instances in which farmers are able to hold their wheat, but in the absence of organised effort on the part of the combined farmers as a whole, a large majority must obtain cash immediately after harvest, either by selling out entirely whatever the market price of that particular urgent time may be, or by obtaining an advance upon storage. Then, as the millers either directly, or in combination with agencies that seem to be more in sympathy with them than the producers, are the principal storers of wheat, the outcome is easily conceived. The “free storage” and other devices so frequently described in *The Leader* have clearly enough shown how wheat, once it leaves the grower’s own control, is used simply as a means of bearing the market down against the producer, and to the advantage of antagonistic rings. One of the greatest points, therefore, to be gained by the establishment of co-operative flour-mills by the wheat-growers themselves, consists in the fact that thereby they could evade the injury inflicted upon them by this speculative feature of the proprietary millers’ business, and turn that feature round into a means of help. That is to say, the milling trade, as a present conducted, means bearing down the price to the producer, and keeping up the price of flour to the consumer. Clearly, then, the members of a farmers’ co-operative flour-milling association, even if they had at first to accept wheat prices at market rates borne down by the proprietary millers; would not be any worse off in that respect than they are at present; while, on the other hand, having the gristing of their wheat in their own hands, they would then have the combined help of powerful agencies which are at present, commercially speaking, in opposition converted into workers for them in getting them a better price for their wheat in the shape of flour. The crucial question that comes in here, however, is

ARE FARMERS’ CO-OPERATIVE FLOUR-MILLS PRACTICABLE?

In order to gather information in connection with this point the writer last week made a visit to Wagga Wagga, in Riverina, owing to having been informed that “there can be seen a successful example of a co-operative flour-mill run by the farmers themselves.” That the mill in question is a first-class institution of its kind was found to be quite true, and that it is managed most ably, and upon the latest up-to-date principles with respect to the most recent inventions in machinery, and also with regard to capable handling generally, will be readily understood when it is stated that it is in charge of Mr. A. Cumming, one of Messrs. Fry and Co.’s best experts from Victoria. It is called the Murrumbidgee Co-operative Milling Company, Limited, and was established about nine years ago upon a capital of £30,000, in 30,000 shares of £1 each, for the purposes, as set forth in the articles of association, “to purchase land, erect thereon and in their neighbourhood buildings, milling-plant, and railway connections; purchase and sell wheat, flour, bran, and pollard, &c.; and advance or lend money to farmers and others upon liens on crops or other security.” A feature of this mill, in addition to its first-class appliances and management, which have secured for it a leading name in connection with superiority in the quality of the flour produced, is its extensive wheat storage accommodation, all communicating directly with the railway system of Riverina,

as well as the through lines to Sydney and Melbourne. Capable of being worked up to 250 tons of flour per week, the mill gets through on the average about 200 tons a week during the whole year, which means about 125,000 bags of wheat, and for the whole of this there is provided storage, a large portion of which has already thus early in the season been filled up. As the full equipment of so first-class an establishment as this, including land, buildings, machinery, storage, and railway connections, is placed at about £20,000, the balance of £10,000 of the share capital is understood to have been intended for carrying out the clause in the articles referring to "advances to farmers upon their wheat," but this part of the association's original intention seems to have been very largely held in abeyance. In reality the co-operative element is admitted to have been allowed to drift considerably, and the cause is not difficult to find. In order to obtain the required capital the share list has been opened to non-producers to such an extent that they are largely in the majority, with, of course, the consequent result. They, and not the farmers, now hold the controlling influence, so that the mill, while still co-operative in name, is actually proprietary in fact. In this connection, the presence of the following "dividend clause" in the articles of association carries with it its own significance.

The directors may, before recommending any dividend, set aside out of the profits such sum as they think proper as an investment upon such securities as they may select, and may, after providing for a dividend at the rate of 10 per cent. to the members generally on the amount paid up on their respective shares, set aside out of the profits as they think proper for distribution by way of bonus among the members who shall, during the twelve months immediately preceding, have been the vendors of wheat to the company, which sum shall be distributed amongst such vendors in proportion to the quantity of wheat sold by them to the company; but no bonus to any such vendor shall exceed the rate of $2\frac{1}{2}$ per cent. upon the amount paid up on the shares held by him at the time of allotment of bonus.

Relegating the producing members to the position of bonus shareholders, and even that with a limit of $2\frac{1}{2}$ per cent., will be noted as very plainly indicating how far this association has departed from its original idea of co-operation, and how little it now differs from any other proprietary company, in so arranging the profits as that they may be distributed among the "general members," who, having no direct connection with the production of wheat, cannot be expected to have at heart the interests of the wheat-grower exclusively. It is essential, however, in any scheme of organisation for the establishment of a co-operative flour-mill for the benefit of the farmers, that it must be controlled by the farmers, and that the point now to be considered is how is that to be done?

THE SAFE CO-OPERATIVE BASIS.

In seeking to find out how a farmers' co-operative flour-milling association may be formed and successfully carried out in any, or all, of the wheat-growing centres of the colony, past examples, showing what to avoid, are quite as valuable as those indicating what may safely be followed. In pointing to the fact that the farmers have proven themselves capable of co-operative organisation of a most complete kind in connection with the dairying industry, the reply is, "Yes; that is all very well, but starting a flour-mill is a very different thing to running a butter factory, which requires only about £1,000 to start, while a flour-mill needs, according to its size, a capital of from £15,000 to £50,000." While the raising of the larger amount of capital may be admitted as a difficulty, still it is not an insuperable one, and further, it can be overcome, and that without, as in the case of the Wagga mill, emasculating co-operation. Premising that this important matter can be arranged, then there is much to say in favour of co-operative flour-milling by farmers as compared with running a butter factory. Converting wheat into flour under intelligent

directors and a capable manager is an easier and certainly safer business than the handling of milk and the manufacture of butter or cheese. Milk is a very risky article. Wheat, once in the bag, is one of the least risky. Butter and cheese making are extremely susceptible to climatic changes, while flour making is not. Butter, once made, has to be got on to the market as quickly as possible, while wheat or flour can be kept with safety for a much longer period. The necessity for refrigeration makes butter an expensive commodity to carry either by rail or ship, but wheat and flour are the easiest and cheapest of all transportable merchandise, either by rail or as cargo. Butter is subject to deterioration on shipboard, while wheat and flour gain in weight, so as to help considerably to pay the freight. After what the farmers have done in the successful running of co-operative butter factories, it is not reasonable to arbitrarily say that they cannot be equally successful with co-operative flour-mills, and as to the main objection with respect to the necessary capital being greater, there is valuable experience on this point in the past presenting itself as a guide. The earliest butter factories of Victoria were started on a basis that contained within it the germs of destruction, and they necessarily failed. In order to obtain the required capital, non-producing shareholders were allowed to join, and the interests of these not being at one with those of the producers eventually broke them up. Then the rule was adopted that members should be confined to producers of milk, and these only, so that the co-operative principle of obtaining progress payments on the milk, with an eventual full distribution of the profits upon the sale of the butter, was allowed to come into operation, and that has been successful, although not perfectly so for a certain reason. A modified form of non-producing membership was allowed to enter in the shape of the machinery supplying and butter selling agent, who volunteered to save the co-operators from having to pay up the full value of their shares, by erecting the factory, equipping it, and crediting them with the cost. Thus he got his foot in, and apart from handsome commissions on the machinery, &c., together with the heavy interest on the advances, secured the remunerative selling business in connection with the disposal of the products. In this way many factories got into middlemen's books to such an extent as to make it a work of years to get out, so as to be independent with regard to availing themselves of the advantages of direct trading. In this regard the butter factory directors in the south coast districts of New South Wales were more wary, and their example is one that farmers contemplating the establishment of co-operative flour-mills can be commended to follow implicitly, because it is eminently safe. They declined to allow anyone to interfere in the slightest degree with the cardinal principle that they, and they only, should be the independent controllers of their own affairs. First of all they called up all the capital possible from their own shareholders, but any further funds required they borrowed on fixed loan, so as to be able with the command of their cash to buy to the best advantage, and further keep themselves unfettered as to the future. The representative of the loan, usually the local bank manager, was given a seat on the directorate, but he had no controlling power over the association, such as inevitably takes place when capital is raised by letting in to a producers' co-operative organisation a number of non-producing shareholders. The business of the loan representative was to look after the payment of his interest, and when, as soon as possible, the loan was paid off, his connection with the directorate ceased. Assuming, then, that in this proposed new departure the wheat-growers take care to retain full control of their business, by first admitting none but producers into their co-operation; second, raising as much of the necessary capital as possible by paying up on their shares; and third, by obtaining the rest of the capital by loan, either privately or, what would be still better, on the principle of the loans to the Maffra beet sugar factory and the up-country wineries, from the Government, which can obtain money at the cheapest rate of interest, there does not seem, under such conditions, any good reasons against, but many in favour of, the establishment of co-operative flour-mills by the farmers.

FLOUR-MILLING TRADE TABLE OF VALUES.

VALUE OF WHEAT.	VALUE OF BRAN.								
	When the price received by the millers for offal, viz., bran, pollard, &c., is—								
	Per Bushel.	Per Bushel.	Per Bushel.	Per Bushel.	Per Bushel.	Per Bushel.	Per Bushel.	Per Bushel.	Per Bushel.
	9d.	10d.	11d.	1s.	1s. 1d.	1s. 2d.	1s. 3d.	1s. 4d.	1s. 5d.
When the price paid for wheat by the the miller is—	VALUE OF FLOUR.								
	Then the price that must be charged for flour in order to pay 20s. per ton for manufacturing, and leave a clear profit of 10s. per ton, is—								
Per Bushel.	Per Ton.	Per Ton.	Per Ton.	Per Ton.	Per Ton.	Per Ton.	Per Ton.	Per Ton.	Per Ton.
s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
3 3	7 12 6	7 9 6	7 6 6	7 3 6	7 0 6	6 17 6	6 14 6	6 11 6	6 8 6
3 4	7 16 4	7 13 4	7 10 4	7 7 4	7 4 4	7 1 4	6 18 4	6 15 4	6 12 4
3 5	8 0 2	7 17 2	7 14 2	7 11 2	7 8 2	7 5 2	7 2 2	6 19 2	6 16 2
3 6	8 4 0	8 1 0	7 18 0	7 15 0	7 12 0	7 9 0	7 6 0	7 3 0	7 0 0
3 7	8 7 10	8 4 10	8 1 10	7 18 10	7 15 10	7 12 0	7 9 10	7 6 10	7 3 10
3 8	8 11 8	8 8 8	8 5 8	8 2 8	7 19 8	7 16 8	7 13 8	7 10 8	7 7 8
3 9	8 15 6	8 12 6	8 9 6	8 6 6	8 3 6	8 0 6	7 17 6	7 14 6	7 11 6
3 10	8 19 4	8 16 4	8 13 4	8 10 4	8 7 4	8 4 4	8 1 4	7 18 4	7 15 4
3 11	9 3 2	9 0 2	8 17 2	8 14 2	8 11 2	8 8 2	8 5 2	8 2 2	7 19 2
4 0	9 7 0	9 4 0	9 1 0	8 18 0	8 15 0	8 12 0	8 9 0	8 6 0	8 3 0
4 1	9 10 10	9 7 10	9 4 10	9 1 10	8 18 10	8 15 10	8 12 10	8 9 10	8 6 10
4 2	9 14 8	9 11 8	9 8 8	9 5 8	9 2 8	8 19 8	8 16 8	8 13 8	8 10 8
4 3	9 18 6	9 15 6	9 12 6	9 9 6	9 6 6	9 3 6	9 0 6	8 17 6	8 14 6
4 4	10 2 4	9 19 4	9 16 4	9 13 4	9 10 4	9 7 4	9 4 4	9 1 4	8 18 4
4 5	10 6 2	10 3 2	10 0 2	9 17 2	9 14 2	9 11 2	9 8 2	9 5 2	9 2 2
4 6	10 10 0	10 7 0	10 4 0	10 1 0	9 18 0	9 15 0	9 12 0	9 9 0	9 6 0
4 7	10 13 10	10 10 10	10 7 10	10 4 10	10 1 10	9 18 10	9 15 10	9 12 10	9 9 10
4 8	10 17 8	10 14 8	10 11 8	10 8 8	10 5 8	10 2 8	9 19 8	9 16 8	9 13 8
4 9	11 1 6	10 18 6	10 15 6	10 12 6	10 9 6	10 6 6	10 3 6	10 0 6	9 17 6
4 10	11 5 4	11 2 4	10 19 4	10 16 4	10 13 4	10 10 4	10 7 4	10 4 4	10 1 4
4 11	11 9 2	11 6 2	11 3 2	11 0 2	10 17 2	10 14 2	10 11 2	10 8 2	10 5 2
5 0	11 13 0	11 10 0	11 7 0	11 4 0	11 1 0	10 18 0	10 15 0	10 12 0	10 9 0
5 1	11 16 10	11 13 10	11 10 10	11 7 10	11 4 10	11 1 10	10 18 10	10 15 10	10 12 10
5 2	12 0 8	11 17 8	11 14 8	11 11 8	11 8 8	11 5 8	11 2 8	10 19 8	10 16 8
5 3	12 4 6	12 1 6	11 18 6	11 15 6	11 12 6	11 9 6	11 6 6	11 3 6	11 0 6
5 4	12 8 4	12 5 4	12 2 4	11 19 4	11 16 4	11 13 4	11 10 4	11 7 4	11 4 4
5 5	12 12 2	12 9 2	12 6 2	12 3 2	12 0 2	11 17 2	11 14 2	11 11 2	11 8 2
5 6	12 16 0	12 13 0	12 10 0	12 7 0	12 4 0	12 1 0	11 18 0	11 15 0	11 12 0

An increase of $\frac{1}{2}$ d. per bushel in wheat in the above means an increase of 2s. per ton in the price of flour, and an increase of $\frac{1}{2}$ d. per bushel in the value of bran, pollard, &c., means a reduction of 1s. 6d. per ton in the price of flour.

The table is constructed on the basis of 46 bushels of wheat to the ton of flour; offal 36 bushels.

QUEENSLAND AGRICULTURAL COLLEGE.

ON Friday, 1st April, at the invitation of the Hon. J. V. Chataway, Minister for Agriculture, a large party, numbering some ninety gentlemen, interested in farming pursuits was conveyed by special train to the Agricultural College, near Gatton. The feature of the day was the filling of the silo with chaffed Kaffir corn. Professor Shelton, in the course of his remarks at the luncheon, stated that the silo held 50 tons, and had been equal to the support of thirty-six dairy cattle and fourteen horses for three months. The visitors inspected the whole farm, and had the pleasure of seeing fifty-one students engaged in all kinds of work, from building houses and cementing floors to cutting corn and horsehoeing vegetable crops. The applications for admission to the College are so numerous that some twenty applications have had to be refused lately. This is solely owing to want of sufficient dormitory accommodation, but the authorities intend to speedily make such arrangements as will admit of a large increase of pupils by the end of the year. All crops are looking well, but owing to the late heavy rains weeds made great headway as horses could not work on the soddened soil.

THE COCKATOO FARMER.

By A. J. BOYD,

Queensland Agricultural Department.

THE great strides made in agricultural reform during the past few years would give colour to the remark of a late visitor to the Queensland Agricultural College, that—"The day of the cockie is past." And this would appear to be the case to anyone who has only visited the splendid farms on the Darling Downs and on other great plains in different parts of the colony. Not only on the rich treeless plains do we observe the higher forms of agricultural procedure, but they are also in full evidence in districts which were once heavily timbered, such as the land bordering on the Bremer, Brisbane, Logan, Albert, and other south-eastern rivers. Further inland, we see still more evidence of scientific farming, as at Laidley, Gatton, Forest Hill, Rosewood, and in other directions, as, for instance, on the North Coast line from Nundah to Yandina. Everywhere the farmers, whose lands have long been cleared of timber and stumps, have adopted the latest styles of farm implements.

In the dairying districts, again, we see a vast improvement in dairy stock and in swine. On all sides the value of the silo to the dairy farmer is being recognised, and by-and-by we shall hear no more of stock starving for want of feed, since it has been clearly demonstrated that an expenditure of £40 or £50 will enable a farmer owning from 30 to 50 head of stock to tide over a prolonged dry season, or by a larger well-directed expenditure to defy a drought altogether.

Again, it may be observed that the old slab and bark or shingle-roofed "humpy" has everywhere on the plains and on older scrub land given place to the neat well-built "frame house," or, as we should call it in Queensland, the weather-board cottage with its cool verandas and surrounding garden. The only blot on the scene is the universal iron roof. Red tile roofs would add much to the picturesque beauty of the homestead, besides being far cooler than iron and not very liable to damage from any but the most violent hail-storm, which would completely riddle an iron roof.

Here we may utter a word of censure. Whilst steady improvement has been the order of the day in the method of field-work, in implements, buildings, and stock, little thought has been bestowed upon the unhappy pig. While some farmers take care to make these valuable but despised animals comfortable, there are a greater number who take no trouble whatever about them. They either allow them to run about shelterless in a bare paddock, or they box them up in a filthy log sty, knee deep in mud in wet weather, with no protection from the driving rain, and constantly short of water in a dry time. As to feed, this is thrown to them either amongst the muck, or it is put into a trough which is never cleaned out, and besides all this, that food consists in many cases of every description of offal to be found on the farm, such as dead calves, rotten meat, and damaged produce of all kinds, with sometimes a treat, a trough full of skim milk and water mixed with a little pollard.

We have already pointed out how, at comparatively small expense, these poor animals could be made comfortable and happy for the short period of their lives. In Vol. II., part 2 (p. 112), of this *Journal* will be found an illustration of a pig-yard which would amply repay the farmer for building.

What sensible man would expose stud sheep, horses, or cattle to such unnecessarily cruel treatment? And yet stud swine, though in their way equally valuable, are housed in a manner calculated to induce and perpetuate all kinds of diseases which render the flesh of the pig unwholesome and even dangerous as human food. How often must we repeat that the pig is a clean animal by nature, and revels in cleanly food and surroundings? There is no more pernicious idea than that pigs are dirty livers and dirty feeders. They are merely omnivorous, and this very quality makes them so valuable to the farmer, but it certainly should not induce the idea that any muck is good

enough for a pig. That will never enable farmers to get high prices for their swine, or allow them to compete with other countries in the ham and bacon market.

The housing of pigs leads us on to speak of the housing of cattle. Those who have travelled across the vast black-soil plains on horseback, by vehicle, or on foot before the advent of railways, have often had bitter experience of the chilling, cutting, westerly winds blowing across those plains. In wet seasons they have also had a worse time, owing to the sodden country, in some parts so flat that the superabundant water has no means of escape, but that of slowly sinking into the ground. Now, what about dairy cattle exposed to such conditions, as hundreds are? Can any sane person expect to get good milk returns or to rear strong healthy calves from animals tucked up with cold and wet day and night, often without the shelter of a single tree, or gasping with heat and thirst in a shadeless paddock during the hot days in summer? Yet this is a state of affairs which may yet be seen on some otherwise excellently managed farms.

We have not mentioned the condition of agricultural operations in the sugar districts, because on the large estates everything is done which experience can suggest to bring the cane to perfection. Neither capital nor intelligence are wanting here, and it needs only a run through the sugar districts of Bundaberg, Mackay, and other Northern centres of the industry to be convinced that this particular phase of agriculture is conducted on the best and most paying principles.

Let us now consider whether it is a fact that the so-called "cockatoo farmer" is a man of the past. Some may ask, "What is a cockatoo farmer?" The reply is, that he is the man who laid the foundation of the prosperous agriculture of to-day. He is the man who, in the face of great difficulties, made the rich agricultural districts of the Rosewood Scrub, the Isis, the Oxley, Brisbane, in fact; who turned the dense scrub or jungle into the thriving agricultural districts they are to-day. He was the pioneer to whom we owe our present-day agricultural prosperity.

With no capital beyond a few pounds, which he expended in tools and rations, he attacked scrubs which would make a new arrival stand aghast if he were told to go there and make a home and a living for himself, and many of them, despite great difficulties, of which droughts and floods were not the least, are now reaping the reward of their early labours, and are living in comfort and affluence. But are there no cockatoo farmers now? It needs only to travel into the Blackall Range, the Blenheim Mountain scrubs, to take a tour in the North amongst the sugar-growers, on all the Northern rivers, to receive ocular demonstration that the cockatoo farmer is still at his glorious, self-denying, laborious work, and that work will be continued until the very last tree is felled on the very last scrub selection in the country.

When visitors from other lands come to exploit Queensland with a view either to settlement or from mere curiosity, what advice do they get on all sides? "You must take a trip to the Downs, then you will get an idea of the agricultural prosperity and of the agricultural resources of the colony." Only lately it has been decided to issue free railway passes to captains of the British India steamers trading to Queensland, and some of these gentlemen have already availed themselves of the privilege by visiting the Downs. Captain Long, of the B.I.S.S. "Duke of Devonshire," lately made an extended tour in the Warwick and Toowoomba district, and on his return, during an interview with a representative of the *Brisbane Courier*, he stated that he was greatly impressed with what he had seen, and described the land as being "the best it had ever been his lot to travel over." And Captain Long, who has seen many lands and has had many opportunities of seeing fertile agricultural districts, was quite right in his estimate of the Downs country.

There he saw rich lands, vast areas of scientifically farmed wheat land, up-to-date implements, good cattle, good horses, and got among men who were thoroughly up to their business.

But how many sight-seers and globe-trotters ever venture into the mountain scrubs? There is the place to see the true pioneer of Queensland farming. Following the timber-getter and shingle-splitter, come the men dauntless and full of energy who carve out a home for themselves in a wilderness which might well make the stranger exclaim: "Is it possible that men can be found stout enough of heart to attack this tremendous jungle?" Not only are the men found to attempt it, but they do it, and after years of toil and privation, we see, in place of the mass of tree vegetation, miles of cleared land, covered with luxuriant crops of sugar-cane, maize, potatoes, arrowroot, lucerne, &c. Townships arise, sugar-mills are built, and the district where once the sole occupants were the dingo and the wallaby, becomes wealthy and prosperous. No plough or horses can be used by the cockatoo farmer for two or three years. All work is done with the hoe. All his acres are studded with innumerable stumps. Every bag of corn or potatoes has to be carried on his back out of the field. When sugar-cane has been planted on newly-felled scrub it is necessary when his crop is ready for the mill to cut roads through the stumps to allow of the passage of the cane carts. Only after about three years can the scrub farmer begin to indulge in the dream of a plough. Most of the stumps have rotted out by that time, and only the larger ones remain to be laboriously extracted. Often these pioneers locate themselves in waterless scrubs, and in addition to their daily labour have to cart water often for several miles. This is the case to-day in the mountain scrubs between Laidley and Gatton, as it was in earlier times in the Rosewood and other scrubs. The scrub farmer rarely can keep even one cow during his early struggle, so that often he and his family saw no milk except on occasion of a visit to the nearest township. Corned beef and bread constituted the family's daily diet till a first crop of potatoes and vegetables could be grown. To-day a better state of affairs obtains in this respect, owing to the extension of railways, but the labours of the "cockatoo farmer" are the same, and will be the same until, as we said before, the last scrub is cleared. The day of the "cockie," then, is not past.

THOSE SUMMER CROPS.

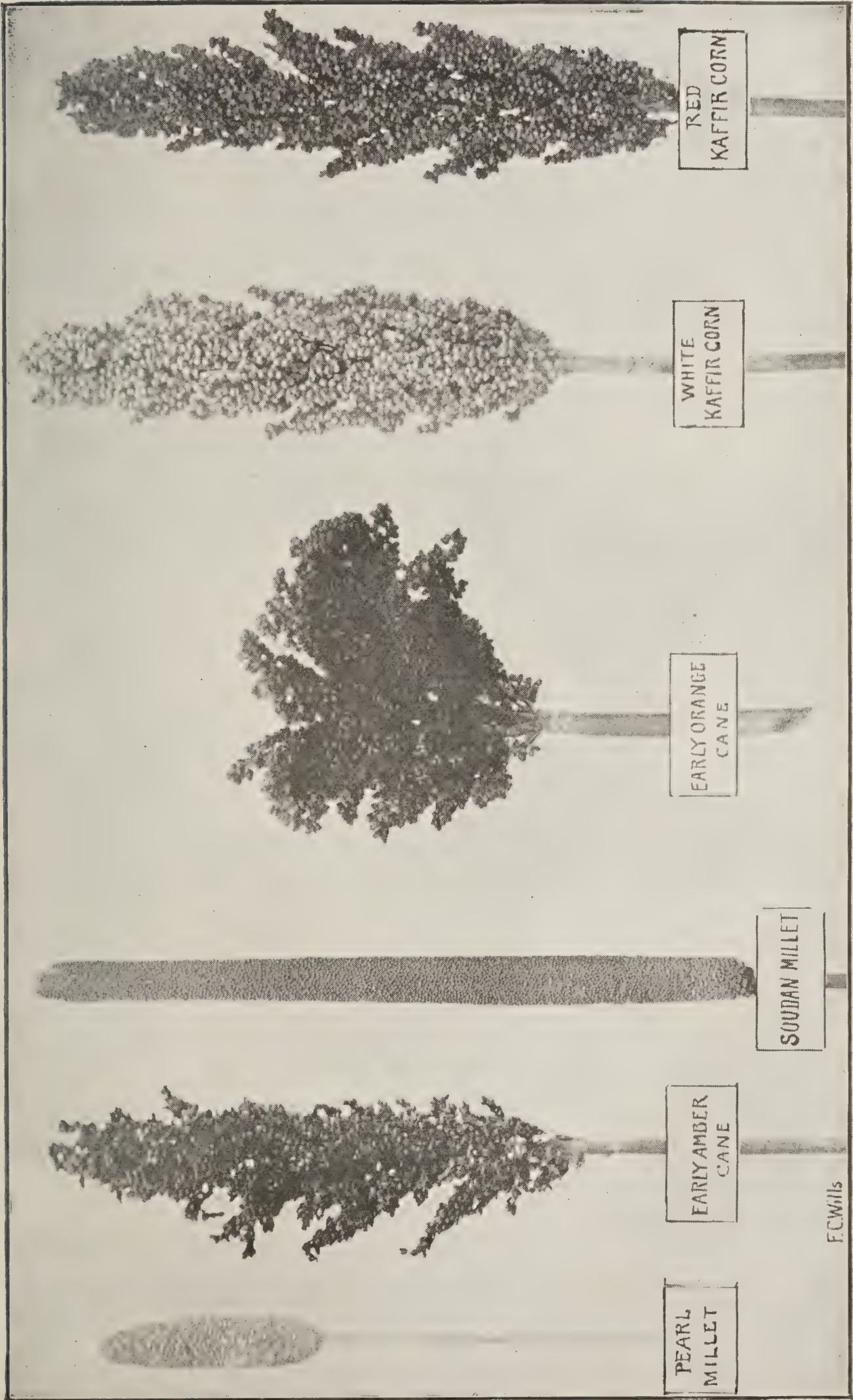
By HENRY A. TARDENT,
Manager, Westbrook Experimental Farm.

My worthy and genial colleague, Mr. J. Mahon, the Government Instructor in Dairying, has often emphasised the necessity for the farmer, who wants to make a success of his dairy, providing shelter and artificial feeding for his cows. The longer one lives here the more one gets convinced that, were this advice rigidly followed, Queensland would become in a short time one of the greatest dairying and bacon-producing countries in the world.

Nowhere else, to my knowledge, do such opportunities exist for having all the year round not only ample provisions of hay and ensilage, but also of greenstuff of some kind; and anyone who has had to do with dairying knows how a small admixture of greenstuff in the daily ration is conducive to good digestion, and consequent good health and full pails.

On the east coast and in the North, where there is hardly any frost, the farmer has special facilities with crops adapted to the climate there, such as maize, lucerne, sugar-cane, teosinte, &c. West of the Range and far inland, we rely in winter on the cereals of temperate countries, such as wheats, oats, barleys, ryes, &c., also rape. For summer we find most reliable and profitable crops in the sweet potatoes (both as a root and stem crop), in the now well-acclimatised cow-pea, and in the varied millets and sorghums.

I have been experimenting with the latter for a good many years, under most varied circumstances of dry and wet seasons. The good opinion I had formed of them as summer crops has been, if possible, strengthened by the systematic and comparative experiments with them carried out this season at the Westbrook Experiment Farm.



MILLETS GROWN AT WESTBROOK EXPERIMENT FARM.

Sorghums and millets thrive best, of course, on a rich, deep, well-drained, sandy loam; but they do fairly well on any soil, provided it is ploughed deep, kept well pulverised and free from weeds. Most of the small millets are better sown broadcast, but the sorghums must be sown in rows.

The rows should be about 3 feet apart, and the sowing thin. This last point is very important. It allows the plants to stool well, and the free circulation of air amongst them favours the formation of saccharine matter in the stem. It also increases the weight of the crop. This season I have sown over 14 acres of a species of American Amber Cane (the *Undendibule*) with but 30 lb. of seeds. The result is a most even and well-grown crop, remarkably rich in sugar, and reaching, at a first cutting, an average of from 15 to 16 tons per acre. A second cutting will bring it to upwards of 20 tons per acre. Of course, such an even and thin sowing can be secured only by using some sort of seed drills such as the hand or horse Planet Junior. The saving in seed, time, and labour repays their full cost in a few days' work.

I will now give below, on those of the sorghums and millets which are most to be recommended, a few extracts from my notes and observations. It is hoped they may prove useful to beginners in agriculture, and to those farmers who have but recently settled in Queensland. The reader is requested to refer to the accompanying plates, taken from Nature at the Experiment Farm by Mr. F. Wills, Artist to the Department of Agriculture.

Setaria italica (*Panicum germanicum*), commonly known as panicum or Hungarian Millet, should be sown broadcast at the rate of from 6 lb. to 8 lb. per acre. Height of stems, from 3 to 3 feet 6 inches. Length of heads, from 5 to 6 inches. The seeds are very small, and form an excellent bird and chick seed. Yield, from 20 to 25 bushels per acre. When not sown too thickly, the *Setaria* stools beautifully, with an abundance of juicy stems and flags, greatly relished by all kinds of stock. It is excellent as greenstuff, makes good ensilage, and good hay. When chaffed, it can hardly be surpassed as horse feed. The seeds, being so small, ought to be sown shallow on a well-pulverised soil. A little shower is needed to give them a start; but after they are well up, they stand the drought remarkably well. The great advantage of this plant is that it matures so quickly, being ready to cut in from ten to twelve weeks. It can thus be grown as a catch crop between two crops of cereals, though as a rotation this is not to be recommended. It can be sown as soon as the frost is over—say from October to March, inclusive.

Yellow Millet.—Another good fodder crop to grow broadcast, but not so profitable as the *Setaria*. Yield, from 2 to 3 tons of greenstuff, and from 20 to 25 bushels of seed, which is unsurpassed for rearing young chickens.

Pearl Millet.—Height, 3 to 4 feet; length of heads, 3½ inches. Average yield, from 6 to 8 tons. Seed, about 20 bushels.

Soudan Millet.—This is quite new to Queensland, and perhaps to Australia, the seeds having been sent out the first time this season from Egypt by the Queensland Commercial Agent, Mr. Finucane. It stools remarkably well, reaches a height of 6 feet. The heads are 12 inches long, spindle-shaped, and covered with innumerable little seeds very similar to those of the Pearl Millet. The plant looks a little like a bush of rushes. The stem and leaves are somewhat parchment-like, which induces one to believe that they will prove to be rather a horse than a cattle fodder. It is likely to be a useful addition to our fodder plants, and can be safely recommended in poultry farming. Average crop, 8 tons. Seeds, over 30 bushels to the acre.

Dari Sorghum.—An Indian variety, growing to a height of 6 feet, with heads 5 inches long; very thick at the bottom, and somewhat of the shape of a telegraph insulator. Those heads are very thickly set with nourishing seeds, good for the same purposes as maize. The average crop is over 40 bushels per acre, but a great drawback is the threshing, the seeds shelling with great difficulty. It stands the drought well, and gives over 12 tons per acre of good green or ensilage stuff.

Yellow Branching and Dhoura.—Two good varieties, standing drought well, and therefore to be strongly recommended to our Western friends. They grow to a height of 5 feet, and average from 12 to 14 tons per acre. The heads bend down under the weight of the seeds, which are equal to corn for all farm purposes. Average yield, from 30 to 40 bushels.

Early Orange Cane.—Beautiful, ornamental sorghum, of stately appearance and heads erect, though heavily loaded with seeds. Average greenstuff, from 20 to 25 tons; average seed production, 40 bushels.

Egyptian and Jerusalem Corn.—Both these are very similar in appearance and in commercial value. Height, 4 feet 6 inches; length of heads, 6 inches. Average fodder, from 5 to 6 tons. Seeds, from 30 to 35 bushels. The seeds are lens-shaped, rich in starch, and excellent for horse, pig, and poultry feed. When ground they make also a good porridge.

Red and White Kaffir Corn.—Two excellent varieties which I consider as the coming corn of Western Queensland. Height, 6 to 7 feet; heads erect, beautifully shaped, and ornamental. They are from 10 to 12 inches long, and loaded with innumerable round seeds, amounting to from 40 to 45 bushels per acre. Same use as maize.

Sorghum saccharatum, or Common Black-seeded Sorghum.—This is probably the variety which has so far been most extensively grown in Queensland, which was, I believe, a mistake. True it extracts a considerable amount of stuff from the soil and atmosphere, the average crop being from 15 to 20 tons, with from 30 to 35 bushels of seed; but farmers, especially dairymen, object to it—I believe rightly so—on account of the poor results it gives at the pail. It suffices to examine a stem to see that it is more fit to fill the stomach than to nourish the body, being composed of an envelope of hard woody fibre with a tasteless, juiceless, cork-like marrow inside.

Planter's Friend, though better, offers similar disadvantages, the stems being also somewhat coarse. It is a heavy yielder, however, averaging from 15 to 20 tons of greenstuff, and over 40 bushels of seeds; but, I am sorry to say, it does not stand dry weather as well as other sorghums.

The *Farmer's Friend*, or Imphee, is also a most valuable member of the family. Where the rainfall is copious and reliable, it can be sown broadcast. In the drier districts it withers during a drought unless sown in drills. In this way the land can be kept well cultivated; the moisture remains much longer in the ground. The Imphee gives several cuts according to seasons, and for two or three years it will regrow from roots without requiring to be resown.

Early Amber Cane and *The Undendibule* are two American varieties of great merit. I have no doubt they will be extensively grown as they become better known. We had, this season, 14 acres of the latter kind, with which we are now trying to make an ensilage stack. The crop has elicited the unanimous approval of all those who saw it. The stems are long, leafy, juicy, and remarkably sweet. Judging from taste and appearance only, the quantity of saccharine matter must be very considerable indeed. The average weight of greenstuff and of seeds is probably unsurpassed by any of the above varieties.

The so-called Broom Millet (or *Sorghum communis*) will require a special article to itself on account of its considerable economic value, and the special treatment it requires before the fibre is ready for the market.

The want of proper appliances to cut the sorghums at harvest time has been so far a considerable drawback to their profitable cultivation. That difficulty is now overcome. The Columbia Cornharvester, which we are now using on the Experiment Farm—the first and unique specimen ever introduced into Queensland—cuts the crop and delivers it in tied sheaves or bundles, with an economy of 90 per cent. on hand labour. I have no hesitation in saying that it is the greatest labour-saving acquisition our agriculture has seen since the introduction of the reaper and binder for the harvesting of wheat. It is likely to be the so long looked-for solution to the question of profitable maize-growing and dairying.



KAFFIR CORN. WESTBROOK.

For those who cannot afford to buy it, or who have only small fields, I have made here, on the Experiment Farm, an exceedingly simple implement, which is within reach of the poorest farmer. It cuts clean and level with the ground, and lays the stuff evenly along the row, but, of course, does not bind it. With it a man with one horse can cut from 10 to 12 acres a day, effecting thus a still considerable saving of time and labour.

ONION-GROWING ON THE NORTH COAST.

By F. G. PIGUENIT.

As the time has arrived for sowing onions, it will not be out of place to give directions for preparing the land, sowing the seed, and after-cultivation of this valuable vegetable. There is no reason why the onion should not be grown to a large extent on the North Coast, but the chief thing the grower must aim at is to grow the varieties suited to the district, as, after repeated tests extending over a number of years, I find that only two varieties, so far, have proved themselves adapted for our North Coast climate.

All the favourite brown and yellow varieties are late, and will only give some 20 per cent. of inferior bulbs, the remaining 80 per cent being thick (or bull necks), which are worthless.

For onions to be a successful crop, financially and otherwise, on the North Coast, the first of the crop must be ready to harvest by the 1st of November, and the last should be off the ground by Christmas; if later, the crop is very liable to be entirely lost by excessive rains which usually fall at that season of the year.

The variety which has done so well with me is the Extra Early Barletta, a white onion, which grows to a very large size on the rich scrub lands of the North Coast. The weights of bulbs per acre for the past three years have been:—1895, 10 tons 6 cwt.; 1896 (a very dry year), 5 tons 3 cwt.; 1897, 12 tons 8 cwt.; the first two years the whole of the crop was transplanted out of seed beds, but the third year the seed was sown in drills with a Planet Junior combined drill, then thinned out to about 6 inches apart. Although the white onions do not sell as well as the coloured ones in the Brisbane market, it being such a heavy cropper, it pays to grow.

SOIL.

The most suitable soil for onions is a rich light loam (it cannot be too rich), if possible overlaying a subsoil of gravel, as the onion will not stand stagnant water at its roots. It is a fairly deep rooter, sending its roots down to quite 15 inches. When the soil is heavy loam, the onions will be quite a month later in ripening, but will be much firmer than those grown on the lighter soil, and more suitable for carrying a distance. The best aspect is one that is sheltered from the westerly winds, and that gets the morning sun early.

PREPARING THE SOIL.

Plough the land deeply to quite 15 inches, 18 inches not being too much. The best way to do this is to double plough it by going twice in the same furrow. Then harrow well; roll so as to break all clods; then let it lie, say, a month, to let any weed seeds there may be in the soil come up; then rake it up with a horsehoe to the depth of 6 inches; harrow down level, and work the ground until it is as fine as flour. Finally roll down, so as to ensure a firm seed bed, and then sow the seed. The land must be free of weeds, as the onion, of all vegetables, will be a failure in dirty ground.

SEED AND SOWING.

In the first place, take great care to see that your seed is reliable, and of the suitable varieties for the district—viz., Extra Early Barletta and Early Flat Red. In sowing it is best to use a Planet Junior combined drill, and

here be careful that the word "onion" appears in the slot of the machine. This machine will open the drill, sow the seed, cover it, roll it down, and mark the next drill, all in one operation.

Sow the seed to a depth of 2 inches, according to the weather (and take great care when sowing to keep the rows straight, otherwise the crop will be cut up when machine-hoeing). If it be showery weather, 1 inch is deep enough.

In from nine to twenty days the young onions will appear above ground; they come up looped, resembling a blade of grass.

The distance between the rows should be 18 inches for the Barletta and 16 inches for the Flat Red.

Sow any time from the 1st March until the 15th of April. After the latter date it is too late to get early onions.

The quantity of seed per acre required is about 4 lb.

Sowing broadcast on the North Coast means almost certain failure.

CULTIVATION.

As soon as the young onions appear above ground, and the rows can be followed, take the machine hoe and carefully go through them, straddling the rows. This will require to be done weekly for the first six weeks, carefully pulling out any weeds in the rows by hand. At six weeks old the onions should be large enough to be thinned out, say, to 6 inches apart for the Barletta and 4 inches for the Flat Red, filling up any gaps there may be in the rows by transplanting, but don't transplant when a cold westerly wind is blowing, as the wind will perish the young onions quicker than the sun.

After six weeks, the onions will be too large to straddle; then both hoes must be used in the same row. One hoeing every three weeks will serve to keep the ground loose and open.

By September the onions will be too large to get through with the machine hoe, their leaves entirely covering the ground. If the land is clean, no more cultivation will be required. Keep all the seed heads broken out as they appear, as they destroy the bulb by making it pipey. The two varieties mentioned will not require to have their necks twisted or broken down in any way, as they are perfect bulbers.

HARVESTING.

If sown early, go through the crop about the end of October, and lift any onions of which the leaves are dying away. They will then, if properly grown, have fine thin necks and beautiful flat bulbs; be careful not to bruise them. Top and tail them in the field, and don't put more than about 70 or 80 lb. in a bag. Cart them to the shed, and spread out thinly on saplings, so that the air can come through off the ground. In two or three days they will be dry enough for market. It will take quite six or seven weeks before the whole of the crop is off, harvesting it as it ripens.

THE JERUSALEM ARTICHOKE.

ALTHOUGH this tuber does well in most parts of Queensland, it is not often seen in the greengrocers' shops, presumably because the public taste has not yet been educated to it. There can be no question of its excellence and delicacy of flavour as a vegetable. It is very easily cultivated, and will thrive where no other crop would come to perfection. It should be planted annually, and well repays good culture. Although it will thrive and yield good tubers on any soil, still, like most plants, it has its preference, and that is for a fairly stiff loam. But in this case deep cultivation is of advantage to the crop. Our black and chocolate soils do not demand that they shall be manured for artichokes, but to a sandy soil manure should be applied.

To obtain good results, artichokes should be planted at the end of August and during September. The tubers are planted in rows 3 feet apart, 18 inches between the plants, and covered to a depth of 4 inches. This gives plenty of room for working. When the plants have attained a good size, the tops of them should be cut off to admit light and air to the base. There is very little more trouble to be taken with the crop beyond keeping the plants free from weeds and moulding up when they are about 6 inches to 8 inches high. They are difficult to eradicate, and should be grown where they are not likely to be troublesome.

On this head a writer in the nineteenth annual report of the directors of the North Carolina Agricultural Experiment Station (U.S.) says:—"The plant gets to be such a troublesome weed in the garden that it is not advisable to give it a place there, although when grown extensively the tubers are considered good food for hogs. A good way to get rid of them is to turn the hogs in on them, and they will soon find all the tubers. This is seldom practicable in a garden, and therefore they had better be kept out."

CROSNES, OR CHINESE ARTICHOKE.

In the very comprehensive catalogue of seeds and plants issued by Messrs. Law, Somner, and Co., of Melbourne, we find the following notes on a new tuberous vegetable introduced from China under the above name:—"It is a hardy plant, producing a large quantity of tubers in the same way as the potato. Its culture is very easy, as it grows well in any good garden soil, and is readily propagated by means of its numerous tubers. They may be left in the ground until required for use, as the severest frost does not injure them in any way. The best and simplest way of cooking this vegetable is to boil in water with a pinch of salt, then fry them. They are of delicate flavour, somewhat resembling boiled chestnuts."

It would be well to know whether this new artichoke becomes such a nuisance in a garden as the Jerusalem variety.

OLD BONES, AND HOW TO UTILISE THEM.

THIS is a problem that occurs to every farmer who realises the value of bones, and is accordingly saving of them. Bones that are comparatively fresh from the animal are richer in plant food or animal food than bones that are old and weather-beaten. Theoretically, these elements (nitrogen and phosphoric acid) are worth for fertilising purposes more than the prices which they would cost in fertilisers or chemicals. However their value may be figured, it is too much to permit bones to be wasted. They contain a large amount of lime, but the chief value of bones is in their nitrogen and phosphoric acid, as follows:—100 lb. of bones contain, besides lime, water, &c., nitrogen—Fresh bones, 4 lb.; old, but not weather-beaten, 3 lb.; badly weathered, 2 lb.; phosphoric acid—Fresh bones, 20 lb.; old, but not weather-beaten, 22 lb.; badly weathered, 16 lb.

The quickest and simplest method of utilising old bones is to burn them in the kitchen stove, and carefully save the ashes. In this way you get in the ash all the phosphoric acid and lime there is in the bone, but you lose the nitrogen, which goes off as gas in the smoke. Where the quantity of bones is small, however, and especially if the facilities required for other methods of using them are not at hand, and, if the bones cannot be sold at a fair price, this burning saves them from going to waste. Bone makes an intense heat, and as far as it goes is a valuable fuel. Of course every thrifty farmer saves all the wood ash from the house, for it is so rich in phosphoric acid and potash that not a pound of it should be wasted, but every bit of wood ash, whether containing bone ash or not, should be religiously preserved. Every intelligent and thrifty farmer knows the value of a dressing of rich wood ash and fine bone meal.

Except for the loss of combination of wood ash and bone ash nitrogen by burning, this home-made fertiliser will accomplish nearly as good results as the famous unleached wood ash and bone meal mixture.

Green or fresh bones properly ground yield a meal that has a comparatively high feeding value, not only for poultry, but in small doses for all other stock. The value of this meal for poultry is no longer questioned, and, where a large number of fowls is kept, some one of the various cheap bone-grinding machines is in constant use on such material, which is carefully gathered for this purpose. Fresh bone contains more nitrogenous matter than old bones long exposed to the weather. Therefore the latter will not have as high a feeding value. Still it might pay even to grind old bones for feed, especially as any surplus not used for feeding will make a valuable fertiliser. Indeed, it would pay at least one person in almost every school district to put in a bone-mill, and make a speciality of collecting bones from the neighbourhood, or grinding them at custom rates for both feed and fertiliser.

Bones can also be softened somewhat by composting them with unleached ashes. First make a layer of ash 6 inches deep or more, then a layer of bone 2 to 4 inches deep, then another layer of ash, &c., finally covering with several inches of earth. Leaves, rakings, or other waste about the buildings might be put on as a covering also. Make holes with a pointed stick at short distances through the pile, and wet it thoroughly with a strong solution of lye or house-slops. In the course of six months or so, the compost heap may be forked over, and all but the larger bones will be found to be more or less softened or dissolved, and even the larger particles can be readily broken with the fork.

Bones can also be dissolved with sulphuric acid, but usually it is a nasty and unsatisfactory job, and more bother than it is worth. The acid is also bad stuff to handle, as it burns the skin or clothes with which it comes in contact. A convenient way of using it is as follows:—Set a hogshead a little more than halfway into the ground. Weigh the bone, and fill the hogshead to within 4 or 5 inches of the top. It will hold 400 or 500 lb. of raw bones. To each 100 lb. of bone first add 60 lb. of water, then add 60 lb. of sulphuric acid, full strength. Cover at once with the head that was removed from the top of the cask. The whole should begin to heat up and soon boil. Let it stand twenty-four hours, or until cooled off. Remove the cover in a couple of hours, and see that the bones are all covered. When cool, stir from the bottom to see that the bones are all dissolved. If not, leave for another day or two. Then add five or six pails of water to the mass. Start a compost heap 12 or 14 feet long and 4 feet wide, with 4 or 6 inches of loam, leaves, or other waste vegetable matter at the bottom. Dip from the cask and pour on until the compost is soaked. Then add another layer of earth, and dip till the liquid is soaked up. If you have any wood ashes, use these in the compost heap. Let the whole compost stand for some weeks, when, after being forked over, it should be comparatively dry, and contain but few large bones, and these should be readily broken up. Often, however, the quality of acid or the proportion of water used is such that the bones are not fully dissolved, and the whole job is a disappointment.

The latter method of using whole bones—that is, where they are not burned—gives us a compost of mixture that contains a goodly proportion of lime and phosphoric acid, and a little nitrogen in a more or less inert or slow-acting form. To make a well-balanced fertiliser, add to the compost 10 to 20 lb. of high-grade muriate of potash (or three times as much low-grade potash salts or kainit) to every 100 lb. of bone used in the compost, thus supplying its deficiency in potash. If you want to add some nitrogen in a quick-acting form, to give young plants a quick start until they can be fed by the slower acting nitrogen supplied by the bone, add, say, 20 lb. nitrate of soda or sulphate of ammonia, or rather more dried blood, to every 100 lb. of bone. These articles may be added to the pile as it is being forked over, or they can be broadcasted upon the land to which the compost is

applied, and harrowed, cultivated, or hoed in. Cotton-seed meal, gluten meal, linseed meal, dry or wet fish, castor pomace, and other nitrogenous material may also be used in connection with such a compost, on account of the richness in nitrogen.—*Adelaide Observer*.

BRUSSELS SPROUTS.

ON paying a visit last summer to the Queensland Agricultural College at Gatton, we were shown a bed of fine Brussels sprouts which were equal to any grown in the old country. The soil on which they were produced is a rich deep black loam, which works down to a very fine tilth, and which appears particularly adapted to the growth of all the Brassica family. The cabbages and cauliflowers grown at the College certainly cannot be excelled in any part of Australia. Now, if Brussels sprouts can be successfully grown on the Lockyer, why should they not be equally well produced elsewhere, under like conditions? They are no more expensive or difficult to produce than cauliflowers, and yet we never see them in any vegetable or fruit shop in Brisbane. If the seeds are sown in June or August, and again in November and February, given a fair season and suitable conditions of soil and cultivation, success is almost certain. The cultivation is the same as for cabbages, but owing to their height they require more room. The proper distance is 3 feet between the rows, and the plants 2 feet apart. The plant rises with a very long stem, which has a spreading head at the top. In order to facilitate the formation of the sprouts (which are really only diminutive cabbages), the large leaves should be broken down at all the joints in the stem. The sprouts will then form in a thick cluster round the stem from the root to the top. They should be gathered when they look like half-open rosebuds, and it is advisable when removing the first crop of sprouts to do so with a sharp knife, so as to avoid making a large wound, which would be the case if they were plucked off. The Brussels sprout is a most delicate vegetable, and is relished by many who do not admire cabbage as a dinner vegetable. For table purposes it has the advantage that the quantity required for a given number of persons may be cooked without, as in the case of a large cabbage, destroying a considerable portion of it.

FOUR YEARS' FARMING IN NEW SOUTH WALES.

UNDER the *nom de plume* of "Boss Cockie," a New South Wales farmer gives his experience of four years' farming to the *Sydney Stock and Station Journal*, as follows:—

Hereunder is an accurate statement of farming operations for the last four years:—

Year.	Cost of Ploughing, Sowing, Seed, Horse Feed, Repairs, &c.	Cost of Harvesting from Stripper to Buyer.	Total Cost of Production.	Yield.	Prices Realised.
	per acre. s. d.	per acre. s. d.	s. d.	per acre, bushels.	per bushel. s. d.
1894	8 2	5 11	14 1	11 ² / ₃	2 0
1895	7 6	5 1	12 7	7 ¹ / ₂	4 0
1896	12 6	5 9	18 3	10	4 4 ¹ / ₂
1897	11 7	6 5	18 0	11 ² / ₃	3 7

Averages ... 15 9 ... 10¹/₄ ... 3 6

Net Return, 20s. 1d. per acre.

In 1894, 350 acres were under cultivation, and 885 in 1897. In 1894 and 1895 all old land was cultivated, and in 1897 and 1896 mostly new land.

In 1896 and 1897 cost of production was increased, because of the dry seasons, horsefeed, ploughshares, and seed, all costing more per acre. The methods I adopt are to break most of the rules of the average farmer. I don't wait for rain before ploughing old land, and plough new land in the spring. Start sowing in March, and do not put bluestone on the seed wheat if sowing on dry land. Sow not more than three-quarters of a bushel to the acre; 30 lb. is sufficient if the seed is good. I clean all the seed wheat a second time before sowing, and take seed wheat off new and fallowed land only. I use two and four furrow ploughs, sow with Massey-Harris seeder and cultivator, and roll or harrow the ground after the cultivator according to the state it is in; if not too wet, rolling is by far the best method. I am in favour of stumpjump ploughs where heavily timbered land has to be cleared, because the cost of clearing is reduced by more than a-half, and my experience is that land ploughed with the stumpjump plough will yield quite as much as land cultivated with a set plough.

With respect to the results of wheat-farming in Queensland we are not in a position to give detailed information such as the above, but speaking generally of known operations they come out better than many imagine. For instance, in the Warwick district, we know of one case in which a landed proprietor ran a seventy-acre farm on shares with another farmer. The owner found the land, some farm implements, such as ploughs, harrows, &c., and three horses. The working partner provided seed and all other necessities. When a division was made at the end of the year, the land-owner received £150 for his share, after all expenses had been deducted from the proceeds of the crops. In 1896 another farmer in the same district rented a farm from a proprietor. The rent was fixed at one-fourth of the produce. When the day of settlement arrived, the owner received upwards of £100 as his share of the wheat alone, whilst his share of the maize and other crops was an equal amount. The area cultivated in this case was sixty acres, and the returns showed a profit of nearly £6 15s. per acre. These are facts, and we only regret that we cannot give a detailed statement of the total cost of production.

LIABILITY OF NURSERYMEN.

It is not seldom that we hear complaints made by agriculturists, market gardeners, and horticulturists about the quality of the seeds, flowers, and trees purchased by them from seedsmen and nurserymen. In perhaps nine cases out of ten the fault will be found to lie with the purchaser. Common sense will show that it would not be advantageous to any respectable seed warehouseman or nurseryman to impose upon his customers by selling old seeds, or even a few old seeds mixed with new. The imposture could last but a very short time, as would the delinquent's trade. A fraud in trees (as instanced in the article in last month's *Journal*, entitled "Fruitgrowers, Past and Present") takes longer to bring to light, but there is an old German proverb which says—

Es ist nichts so fein gesponnen,
Es kommt doch auf die Sonnen.

In plain English this simply means, "Hide a fraud as cleverly as you like, yet it will eventually be brought to light."

We have not heard of any action ever having been brought against a seller of plants or seeds in these colonies on a question of warranty; but a case lately occurred in England, which, summarised, amounts to this:—An orchid fancier sold out his stock of plants, and amongst the orchids described in his catalogue was one which he named or asserted it to be a variety known as the *Cattleya aclandiæ alba*, with seven bulbs, three leaves—the only known plant. This

orchid was purchased for 20 guineas, the purchaser, no doubt, being delighted at being the only possessor of such a rare orchid. He cherished this treasure for two years, and at the end of that time, instead of a white, it bore a purple blossom. The seller was forthwith sued for damages for "false warranty." These damages were set down at £50. Much more might have been claimed; but the small amount was merely to enable the plaintiff to bring the action within the jurisdiction of the county court. There was no dispute as to the facts—the so-called unique orchid was not what it was guaranteed to be. The question was whether the plaintiff could claim for more than the difference between the price he paid (20 guineas) and the actual value of the orchid (about 10s., the plant not being an "alba"), or whether he could claim the difference between the lower price (10s., as for an ordinary orchid) and the value of the plant at the date when it flowered, supposing it really to have been the rare plant described in the defendant's catalogue. The latter paid into court a sum of money for damages on the first of these suppositions, with something added for the care and labour bestowed on the plant during two years by the purchaser. The case had already been decided in the lower court, and this was an appeal from the decision of that court. The decision had been that the first supposition was the proper basis for estimating the damages on the warranty given. Hence the appeal, the plaintiff alleging that damages on the warranty should have been paid on the higher scale—viz., that on which he had claimed. The defendant took the opposite view naturally. As such a case was entirely novel, no precedents were quoted, and consequently much learned argument ensued. The case is deemed to be one of great importance, because of the novel principle on warranty which it introduces, and because of the minimum area of trading interests which may be affected by it. The appeal court gave judgment that damages should have been assessed on the higher scale.

THE HOT WATER TREATMENT OF SEED WHEAT.

To disinfect seed wheat by the hot water method, a furnace or other heating apparatus must be provided, having capacity for two, at least, considerable boilers, containing water at 120 degrees and 135 degrees respectively. A smaller vessel containing boiling water, and an abundant supply of cold water should be within easy reach. The seed to be operated upon may be in a loose gunny sack, or preferably a vessel made of fine gauze, or similar material, that will permit the free movement of the hot water among the seeds. Not unlikely, a well-perforated kerosine tin, where small quantities of seed are treated, would be found to answer the purpose excellently. The vessel, which should never be full of grain, should be plunged into the first boiler containing water at 120 degrees, in which the seed basket or sack should be moved about for a minute or two, until the grain has all been warmed by contact with the water. Then plunge the seed basket into the boiler containing hot water at 135 degrees. The seed should remain in the second boiler ten minutes, during which the grain should be moved about and agitated in such a manner as to ensure the complete contact of every grain with the scalding water. If the temperature of the water should fall during this process, it must be maintained at not lower than 132 degrees by additions of boiling water. At the expiration of the ten minutes' submergence in the hot bath, the seed should be plunged into cold water and then spread out to dry, after which it is ready for sowing. This plan has the merit of cheapness, and it may be applied at times and places where bluestone or other chemicals are not available.

But, besides these advantages, an increased yield is obtained from seed thus treated—that is, *considerably greater* than would ordinarily be obtained by replacing the smutted ears by sound ones. To put it in another way, it has been shown by Jensen and others "that the per cent. of heads destroyed by smut does not represent the (total) amount that will be recovered in the seed."

The hot water method has an additional advantage over the old method with bluestone in that, in ordinary practice, it is responsible for the destruction of less seed. Whatever precautions may be taken, the corroding action of the bluestone is certain to be fatal to the germinating powers of more or less of the seeds to which it is applied.

The following table prepared by Professor J. C. Arthur, it is very important to note :—

GERMINATING POWERS OF WHEAT TREATED WITH HOT WATER.

Temperature of Water.					Time of Immersion.	Per cent. Germinating in 24 hours.	Total per cent. Germinating.
Untreated	...	...	...	...	...	9·8	94
130 degrees	...	...	...	...	5 minutes	14·5	90
135 "	...	...	...	...	5 "	12·4	91
140 "	...	...	...	...	5 "	6·7	73
145 "	...	...	...	...	5 "	1·0	62
150 "	...	...	...	...	5 "	0·0	33

Bulletin No. 22 of the Queensland Department of Agriculture.

YIELD OF WHEAT IN AUSTRALASIA.

In an otherwise admirable article on Western Australia, by Ernest E. Williams, in the March number of the *Windsor Magazine*, the following remarkable statement occurs :—"The average return per acre of Westralian wheatfields for the decade 1885 to 1894, was twelve bushels; and even in the bad year, 1885, 8·09 bushels to the acre were produced, which is *twice the amount* raised from Victorian and Queensland wheat acres."

This is a statement worth analysing. The average yield in each colony during the decade mentioned—viz., 1885 to 1894—is as follows, and is derived from official sources :—

Colony.	Average Yield per Acre. Bushels.			
New South Wales	...	...	...	12·0
Victoria ...	...	...	...	9·9
Queensland ...	...	...	...	14·9
South Australia ...	...	...	...	6·8
Western Australia	...	...	...	11·7
Tasmania ...	...	...	...	17·4
New Zealand ...	...	...	...	23·7

Or an average yield for the seven colonies of 9·9 bushels per acre.

It will be observed that Queensland's average during the ten years under consideration was 14·9 bushels per acre, and of Victoria 9·9 bushels, whilst the average yield for Western Australia was 11·7 bushels per acre.

The production of wheat and the acreage under that crop in the seven colonies between the years 1881 and 1894 are shown in the following table :—

Colony.	1881.	1891.	1894.	1881.	1891.	1894.
	Acres.	Acres.	Acres.	Bushels.	Bushels.	Bushels.
New South Wales	221,888	356,666	647,483	3,405,966	3,963,668	7,041,378
Victoria	926,729	1,332,683	1,372,819	8,714,377	13,629,370	11,436,483
Queensland	10,958	19,306	28,997	39,612	392,309	545,185
South Australia	1,768,781	1,552,423	1,576,950	8,087,032	6,436,488	7,781,223
Western Australia	21,951	26,866	21,433	153,657	288,810	170,390
Tasmania	51,757	47,584	52,028	977,365	930,841	872,000
New Zealand	365,715	402,273	148,575	8,297,890	10,257,738	3,613,037

It will be seen that Victoria takes the lead in production, her contribution being 36·4 per cent. of the total yield; South Australia comes second, whilst Queensland produced 364,249 bushels more during the above period than Western Australia.

In the face of these facts we cannot see how it can be said that Western Australia's average yield of 11·7 bushels is equal to twice the average of Victoria—or of either Victoria with 9·9 bushels and Queensland with 14·9 bushels per acre.

WHEAT HARVEST OF 1897-98.

THE following comparison of the wheat harvests of South Australia and Queensland for the past eight years will be of interest to farmers of both colonies, but more especially to those southern farmers who have already cast in their lot with us, or who are preparing to do so:—

SOUTH AUSTRALIA.				
Season.	Acres.	Total Yield. Bushels.	Average per Acre. Bushels. lb.	
1890-91 ...	1,673,573	9,399,389	5	37
1891-92 ...	1,544,600	7,373,770	4	46
1892-93 ...	1,710,355	11,435,272	6	41
1893-94 ...	1,725,423	14,022,125	8	8
1894-95 ...	1,552,900	7,557,446	4	52
1895-96 ...	1,521,910	6,658,600	4	22
1896-97 ...	971,930	2,690,100	2	46
1897-98 ...	988,250	3,705,937	3	45

QUEENSLAND.				
1890-91 ...	19,306	392,309	20	19
1891-92 ...	33,332	462,583	14	58
1892-93 ...	31,750	413,094	14	32
1893-94 ...	34,387	545,185	19	29
1894-95 ...	29,650	123,630	9	33
1895-96 ...	38,942	601,254	17	20
1896-97 ...	53,994	812,602	15	0

The estimate for last year's crop is only an approximation of the actual result, as official returns are not yet available.

Of the above first six crops, 1890-1896 inclusive, 134,929 acres were reaped for grain, whilst 15,411 acres were mown for hay or cut for green feed; 1895 was an exceptionally dry season.

PUMPKINS.

THE cultivation of pumpkins in this colony is really a mere figure of speech. Pumpkins are not cultivated. They grow luxuriantly of their own sweet will. Where a scrub has been cleared off, or 100 fat acres of rich black soil have been made ready for a maize crop, the farmer drops a few pumpkin seeds at intervals when sowing his corn, and the hardy plant in due time runs over the ground, effectually keeping down weeds and sheltering the ground from the burning rays of the sun and preventing evaporation, thus benefiting the corn, whilst producing an immense amount of valuable food for stock. When the corn crop is gathered the pumpkins may be seen lying in tons on the ground, and only require picking up and taking to the barn. But picking up

pumpkins becomes a very laborious business when the crop consists of such monsters as that shown in our illustration. This large specimen was grown at Tenterfield, and weighs 164 lb. We have not ascertained its name (probably it is the "Mammoth Tours"); but it is intended to save the seeds and ascertain if it is a distinct variety, or if it is merely an abnormal growth. Large pumpkins such as this are of doubtful value to the farmer. They are usually soft, and of bad keeping quality, and this is a serious defect in a vegetable which of all others should possess the quality of keeping for a considerable time without deterioration. The market price is usually low for this class of produce, especially when such vast quantities of them follow the first maize crop. They have been sold as low as 10s. per ton, and an instance is known where demurrage was paid on a truck load of pumpkins in order to allow of the market being cleared and thus obtaining a better price when there were few in the hands of produce dealers. At the beginning of winter prices improve, and pumpkins are in demand for feeding stock. At times they have realised £4 per ton, and £2 to £2 10s. is no uncommon price during the winter.

The best keeping pumpkins are the Ironbark, a great favourite in Queensland for table use, and the Japanese small rough variety. The Turk's Turban is also good as a vegetable. The Ironbark will stand a great deal of ill usage, and if carefully stored will last throughout the winter.

Many people have no idea when to pull a pumpkin. The best guide is to notice the curl near the stalk. When this withers, the fruit may be gathered in. Another test which many farmers go by is to try the rind with the thumb nail. If an impression is easily made, then the pumpkin is not ripe, but if the rind is hard and the finger nail will not cut it, the sooner it is pulled the better.

Where it is intended to cultivate pumpkins by themselves, they should be planted in hills 10 feet apart each way, and in each hill a few grains of maize should be sown. The maize will shade the vines and increase the crop, in the same way that the pumpkin vines return the compliment by shading the roots of the cornstalks from the sun.

THE ECONOMIC FEEDING OF WORKING HORSES.

By T. U. WALTON, B.Sc., F.C.S., F.I.C.

It is a generally accepted principle that in order to keep a working horse in good condition a food rich in nitrogenous material must be used, or, as it is sometimes expressed, the "albumenoid ratio" must be high. This ratio is defined as the numerical relation of the digestible nitrogenous matters in the food to the digestible carbohydrates (including any small quantity of fat, calculated into its equivalent of carbohydrate, but not including any digestible fibre which has been found to be useless for the production of work).^{*} Thus a ratio such as 1 : 5 is said to be high, while a ratio of 1 : 12 is regarded as low.

For farm horses, Wolff, the recognised German authority, recommends† a daily diet containing the following quantities of nutriment per 1,000 lb. live weight:—

1.56 lb. digestible albumenoids
11.19 lb. digestible carbohydrates (including 0.5 lb. fat)
Albumenoid ratio 1 : 7.

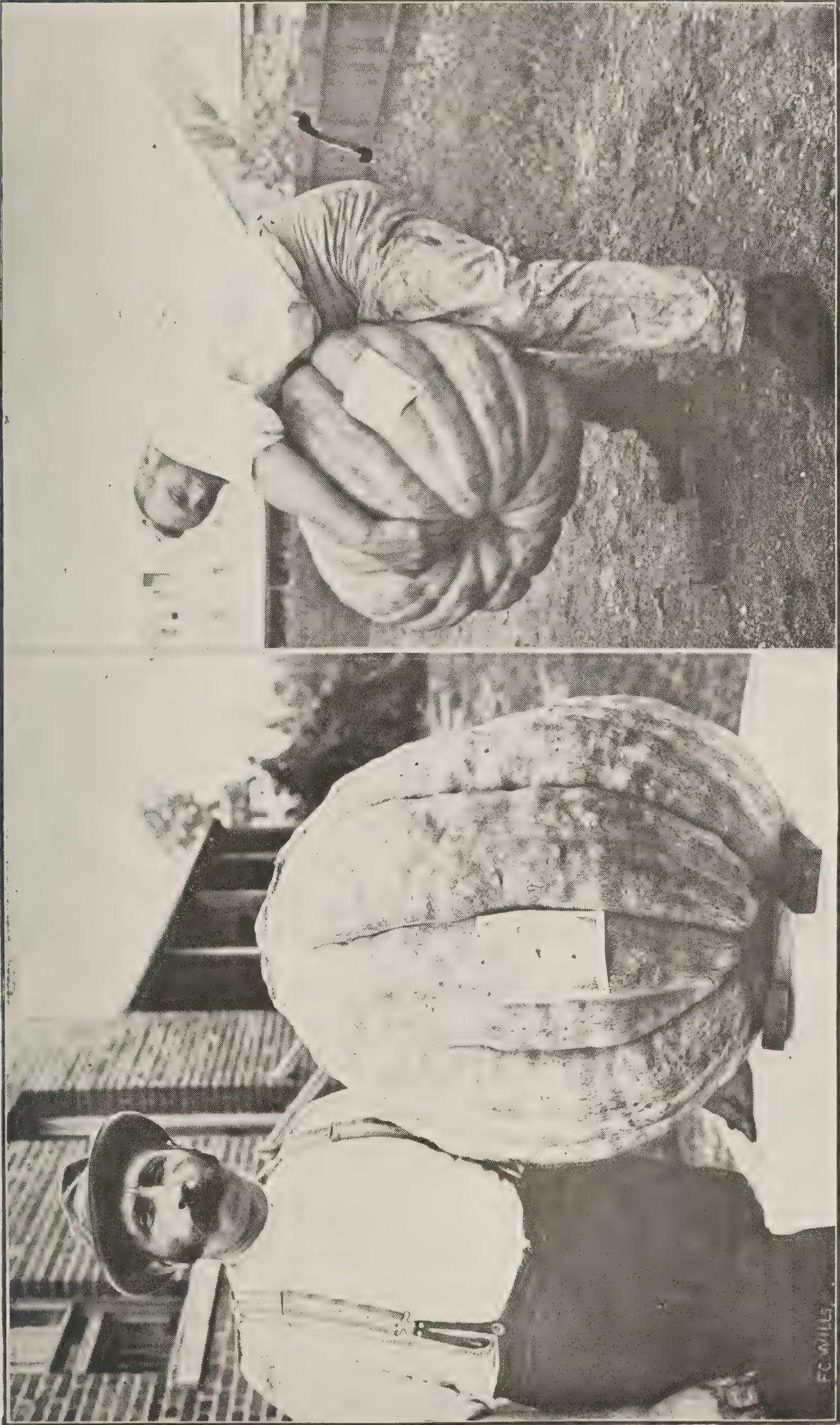
When horses are very hard worked, he recommends an increased diet still richer in nitrogen:—

2.5 lb. digestible albumenoids
13.8 lb. digestible carbohydrates
Albumenoid ratio 1 : 5½.

^{*} Farm Foods, by Wolff, translated by Cousins, p. 111.

† *Ibid.*, p. 242.

Plate XXVII.



PUMPKIN GROWN BY A. M. WHITE, BOLIVIA, N.S.W. WEIGHING 164 LB.

FC WILLS

The object of the present paper is to give a short account of some feeding trials conducted on a very large scale, which prove that, at least under certain conditions, a high diet is not essential to the performance of hard work or the maintenance of good condition, provided sufficient nutritive food be given.

In Fiji the Colonial Sugar Refining Company have about 1,000 head of farm horses, which, until a few years ago, were fed chiefly on oats and maize, with some green cane tops in addition. But this did not prove satisfactory in the trying tropical climate; sickness was frequent, and the death rate high, while the charge for fodder was very heavy. As large quantities of waste molasses were available, it was thought well to investigate whether the sugar in this material might not be advantageously used as a substitute for some of the starch in the ordinary food.

The use of beet molasses for feeding dairy cattle and for fattening stock has in certain parts of Europe proved highly satisfactory, but I have seen no record of its use in the regular diet of working horses. Cane molasses contains much less nitrogen than beet molasses, the Fiji article having only one-fifth of what is usually present in the beet product, and being therefore theoretically less valuable for feeding purposes.

When these trials were commenced, care was taken to begin with only small quantities of new fodder lest the high proportion of salts should prove too laxative. Horses unaccustomed to sugar do not like it at first, but the sweet taste is soon acquired, after which they will eat it in preference to any other food. With the growing appetite for it, the proportion of molasses was gradually increased till as much as 30 lb. per day were regularly given to many of the animals. This large proportion was after a time, however, reduced to 15 lb.; not by reason of any ill effect beyond the tendency to fatten, but because it was considered too risky an experiment with so much valuable stock. Contrary to expectation, the molasses diet produced constipation, instead of being laxative, and a few pounds of bran had to be given daily to keep the bowels in order. The ration finally adopted was 15 lb. of molasses, 3 lb. of bran, and 4 lb. of maize per day, with as much green cane tops as the animal can eat, the molasses being mixed with the bran and chopped cane tops. It may be mentioned that on one occasion when the supply of maize ran out, and had to be replaced by some additional molasses and cane tops, the loss of it for a month or two did not seem to affect in the least the health or working power of the horses. It has not yet, however, been decided to discontinue altogether the use of maize, and the ration referred to (15 lb. molasses, 3 lb. bran, and 4 lb. maize) has now been given daily to the whole stock of over 400 horses at Rarawai Plantation for nearly two years. The result is entirely satisfactory. There has been no undue fattening or injury to the wind, and no tendency to excessive perspiration or softness. In the early stages of the trials a dozen of the animals were weighed once a month, the average weight at the start being 1,273 lb. After the first month there was an average loss of weight of 15 lb. per head, after the second month $4\frac{1}{2}$ lb. of the loss had been recovered, and after the third month there was a further gain of $16\frac{1}{2}$ lb., making a gain over the whole period of 6 lb. per head.

Sickness, which formerly was frequent, is now uncommon, and the horses are capable of performing harder and more continuous work. The improvement in this respect is so great that, while the area of cultivation has been largely increased, it has not been necessary to make any addition to the working stock.

Another important consideration is the financial result. In 1893, with oats as the staple food, it cost £13 3s. per head per annum to feed the stock; in 1897 this has been reduced to £4 2s. 2d., being a saving of over £9 per annum. Such a saving, however, has only been possible by reason of large quantities of waste molasses and valueless cane crops being available on the spot. Cane tops cannot in ordinary circumstances be procured for horse feed by the farmer, though lucerne or any fresh grass is even more suitable. Then, for molasses, which at a sugar-mill has little or no value, a price has elsewhere to be paid to

cover the cost of carriage and handling. But this is not all, for the Customs tariff makes the use of molasses for feeding purposes almost prohibitive in all the Australian colonies in which it is not produced. In Queensland and New South Wales, with production of molasses beyond the demand for it, the tariff is inoperative, the selling price being actually lower than the duty itself. Yet even in the colonies where duty is charged it is a question whether it would not pay to use a certain proportion of molasses, containing as it does more digestible matter than oats,* though much less nitrogen, especially as it will often render palatable some dry food that is not otherwise readily eaten.

It is worthy of mention that at a second plantation in Fiji to which the molasses system of feeding has been extended the same satisfactory results were not at first obtained, and it was only after a considerable time that the cause of failure was discovered. The molasses had to be pumped into a storage tank, but, proving too thick to be taken readily by the pump, it was thinned out with water by the engineer. Fermentation soon commenced, and the stock began to suffer from purging, which was for a time wrongly attributed to the molasses.

According to Wolff,† the whole of the albumenoids and carbohydrates in molasses are digestible. Taking Wolff's analysis‡ of bran and maize in the diet that has been described above, but neglecting the cane tops, would give the following digestive constituents:—

1.02 lb. albumenoids, 12.53 lb. carbohydrates, and 0.19 lb. fat. Taking 1 of fat = $2\frac{1}{2}$ carbohydrates, and reckoning the average weight of the stock at 1,270 lb., the constituents per 1,000 lb. live weight are—

0.80 lb. digestible albumenoids
10.24 lb. digestible carbohydrates (including 0.15 lb. fat)
Albumenoid ratio 1 : 12.8.

The weight of the green cane tops is not exactly determined, but this is about 30 lb. per 1,000 lb. live weight, or 38 lb. per horse. At the same time the nutriment in this fodder is low, and its albumenoid ratio is only 1 : 9, so that any variation in the quantity used has but a trifling influence on the whole diet. Taking the quantity as 30 lb. per 1,000 lb. live weight, this would add to the diet 0.33 lb. digestible albumenoids and 3.07 lb. digestible carbohydrates (including 0.22 lb. fat).

The whole daily ration is then per 1,000 lb. live weight:—

1.13 lb. digestible albumenoids
13.31 lb. digestible carbohydrates (including 0.24 lb. fat)
Albumenoid ratio 1 : 11.8

Also 1.80 lb. salts.

It is thus seen that the full proportion of carbohydrates considered necessary by Wolff for a hard-working horse has been experimentally arrived at in these trials, but that only half the orthodox proportion of albumenoids has been found necessary, and only half the fat. Probably the warmth of the tropical climate renders the smaller proportion of fat sufficient, but the satisfactory results obtained with the reduced proportion of albumenoids prove that the current theory on the matter is erroneous.

The conclusions that can fairly be drawn from the trials that have been made are:—

1. That, for working horses, the sugar in cane molasses is a satisfactory substitute for starchy food, being readily digested and transformed into work.
2. That 15 lb. of the molasses can be given per day to a 1,270-lb. working horse with advantage to the health of the animal and to the efficiency of its work.

* According to Wolff (Farm Foods, translated by Cousins, p. 306) there is 57 per cent. digestible matter in oats, while molasses contains 64 per cent.

† Farm Foods, by Wolff, translated by Cousins, p. 310.

‡ *Ibid.*, pp. 306, 309.

3. That it produces no undue fattening, softness, nor injury to the wind.
4. That the high proportion of salts in it has no injurious effect.
5. That the albumenoid ratio as low as 1: 11·8 has proved highly suitable for heavy continuous work when a sufficient quantity of digestible matter is given.

TABLE OF ANALYSES.

—					Cane Molasses (Fiji).	Bran (Wheat).	Maize (Grain).	Green Cane Tops.
Digestible albumenoids	...	...			2·5	10·8	8·0	1·1
Do. carbohydrates	...	...			61·5	42·3	67·5	9·5
Do. fibre	...	...	...		...	2·1	1·1	4·4
Do. fat	...	...	...		...	2·4	4·0	0·3
					— 64·0	— 57·6	— 80·6	— 15·3
Indigestible albumenoids	...	...			0·0	2·8	2·1	0·6
Do. carbohydrates	...	...			0·0	6·8	1·1	4·1
Do. fibre	...	...	...		0·0	12·6	1·2	3·0
Do. fat	...	...	...		0·0	1·0	0·7	0·3
					— 0·0	— 23·2	— 5·1	— 8·0
Water	...	...	...	...	26·0	13·6	12·7	75·2
Ash	...	...	...	...	10·0	5·6	1·6	1·5
					— 100·0	— 100·0	— 100·0	— 100·0

The analyses of bran and maize, as already stated, are from Wolff; those of molasses and cane tops have been made in the Sugar Company's laboratory; the separation into digestible and indigestible constituents in the cane tops being based on Wolff's analysis of sorghum.—*Mackay Sugar Journal*.

Dairying.

PIGS ON A DAIRY FARM.

At a recent meeting of the Murray Bridge Branch of the Agricultural Bureau, Mr. W. Lehmann read the following paper on the above subject:—

Rearing and fattening pigs on a dairy farm is a profitable undertaking for the farmer, providing it is carried out on the best principles possible: otherwise it may turn out a useless waste of food and labour. Pigs consume all waste on the farm, such as skim milk, fallen fruit, unsaleable potatoes, drake, &c.—articles, which, as a rule, have no selling value, but if fed to pigs can be made to turn out as profitable as the principal products of the farm.

To begin with, you must choose pigs that have not been starved in their youth, and should be a cross with the Berkshire, or nearly pure Berkshire, if you have an abundance of feed. A Berkshire boar, mated with a well-shaped sow, suitable for breeding, not necessarily of any pure breed, would produce a good class of pigs. The sties should be roomy and comfortable, facing east, to ensure warmth of a cold winter morning, so that the sun when rising would shine into the part where they have their lair. This is essential for young pigs, as they suffer from the cold. A yard could also be constructed to allow for exercise, as small wet sties will cause pigs to become cramped and crippled in their legs.

It is also necessary for the farmer to grow certain kinds of products to help to fatten pigs with, besides the waste, such as barley or peas, or anything that will give a good return in his particular district, and would not exhaust the soil to the same extent that growing wheat would. Heavy crops of barley have been grown in and around this district in good seasons. This could be stored in barns, and lasts for several years for pigs' food, and would do away with buying expensive food in bad seasons. A successful farmer in this district purchased a well-bred Berkshire boar, a prizetaker, at the Mount Barker Show, the progeny being a nice, evenly-grown class of pigs. When the young pigs are about five months old they are shut up and fattened on skim milk and barley; at seven months they are fit for market, and weigh from 100 lb. to 140 lb., and, being well fed and fine pigs, he gets top prices. The more careless farmer lets his pigs roam about in grass paddocks, feeds them with skim milk when he has got some, and manages to get some fat when the grass is green and his cows are all in milk; but, being grass-fed pigs, they make poor quality bacon, and when their heads are cut off very little is left of them; consequently the bacon-curers shun his pigs, and he has a difficulty in getting rid of them. The unthrifty farmer shuts his pigs up in a small, badly protected sty; he bundles them all in, large and small; consequently the larger ones get nearly all the feed, and the small ones starve. Having been informed that such a farmer had some fat bacon pigs to dispose of, I went to inspect them, and found them up to their knees in muck, the larger ones feasting on part of a fresh-born calf, the smaller ones turning over one of their dead mates, looking for a part to begin on. Coming there about feeding time, the owner was about to give them their midday food, which consisted of two kerosene tins of swamp water with a few handfuls of pollard added. He never succeeded in getting them fat, but had to kill and eat them himself to save buying more pollard. Before getting through all of them, he and his wife were laid up for weeks with acute indigestion.—*Adelaide Observer.*

THE DAIRY INDUSTRY OF SWEDEN.

IN a report on the dairy industry of Sweden, issued by the Foreign Office, it is stated that, besides the small dairies which make butter and cheese for home or local wants, there are 1,800 large dairies, at 1,420 of which butter alone is made, at 210 cheese alone, and at the remaining 170 both butter and cheese. These large dairies are divisible into four classes—(1) 625 “estate” dairies, dealing only with their own milk; (2) 320 estate dairy factories which handle both their own and purchased milk; (3) 515 dairy factories which buy all the milk they require; (4) 340 co-operative dairies. In the year 1896 about 175,000,000 gallons of milk were converted into butter and cheese, and yielded 512,000 cwt. of butter, 50,000 cwt. of whole-milk cheese, 15,000 cwt. of half-milk cheese, and 80,000 cwt. of skim-milk cheese. Most of the butter is exported to England, partly by water direct, and partly through Denmark; the cheese is chiefly consumed in Sweden. The largest co-operative dairies, some of which have over 400 members, handle as much as 4,000 gallons of milk a day. The profits of co-operative dairies are not taxed, “because these institutions are not considered to form a separate business or trade, apart from the farms which contribute to their produce.” As a rule, the farmers take back from these dairies all skim-milk and butter-milk, which are used for feeding calves and fattening pigs. On the other hand, some of the dairies keep calves and pigs, and are thus in a position to utilise the by-products on the spot. In 1895 Sweden exported 24,055 tons of butter, of which 15,450 tons were sent to England, 8,270 tons to Denmark, and 335 tons to Norway.

Horse-breeding.

CROSS-BREEDING.

By "ARAB."

In previous papers I have drawn attention to the poor styles of horses raised throughout Australia.

I have stated that instead of our horses being improved they are being deteriorated by an indiscriminate cross-breeding of formations.

How common the saying has become amongst us, that it is better to buy than try to breed a good horse. The reason for this lies solely in the fact that the stock have become so mixed up on formations, that no idea can be formed when two animals are mated what the progeny may come like.

Where, when, and how the Arab's oblique formation was first perfected and fixed, need not bother us—sufficient to us it exists. Still, if it could be arrived at with any fair degree of certainty under what auspices or set of circumstances this was attained, a valuable object lesson would be given us. History goes to show that all improvement of the horse in any country, towards Arab lines, has invariably been effected, in the first instance, by the intervention of kings and Governments.

There is very certain evidence that the straight formation is the most ancient.

The ancient Egyptian horses are shown on the monuments of Egypt to have had this formation, and their early colonies in Europe must, of necessity, have been supplied with this class of stock; and we find as a consequence, all unimproved native breeds of European horses retain this formation.

In England, improvement of the horse by overlaying with Arab formation was the work of its kings. The pity is that they did not complete their work in the same thorough manner as Alexander I. in Scotland.

Several European Governments have in our day taken this duty in hand, and English thoroughbreds are being used for this purpose.

In Scotland, Alexander I. systematically set about overlaying the horse stock of Scotland with Arab formation on much the same lines as that practised to-day by those European Governments, only he employed the organisation of the Church and its lands to carry forward his projects.

The first Arab known in English history came from St. Andrews, in Scotland. He belonged to the St. Andrews stud, and was supplied from the king's stables and stud. His appearance in England amounts to a clear case of "soldiering" on the part of the Bishop of St. Andrews, who, some time previous, had been appointed or called from Canterbury to St. Andrews by the king. He wished to be consecrated to his office by the Archbishop of Canterbury as his superior—to this the king objected. The difficulty was got over for the time by the bishop taking the mitre himself. Afterwards, having qualms as to the irregularity, he went to Canterbury to confab over the matter, taking this Arab with him—he never came back, nor Arab either. Had his bishopric been as readily travelled as the Arab, no doubt he would have taken it also, the one being held in trust for the public good just as much as the other.

That the improvement of the horses of Scotland by Alexander I. has had most momentous subsequent influence on the history of the human race (by its contributing to the successful issue of the war of independence—it not only achieved Scottish freedom, but in doing so it advanced and ultimately

re-established English freedom, which had been lost for 200 years)—that this British freedom reacts to-day for the freedom of the human race—the daily cablegrams testify. But this is quite outside the scope of this paper. What I wish to convey is, that it educated Scotchmen to Arab standards of what a horse should be.

After a people are enlightened as to what is best and most desirable in a horse—as the Arabs and Scotch are—they may be trusted to conserve the merits of their stock. But with a mixed people, as in Australia, coming from countries where their experience has been exclusively confined to horses of a straight formation, and whose horse authorities have instilled into their minds that it was necessary in a horse designed for strength or work—what hope is there of these benighted horse-owners effecting an improvement in their horse?

The grandest types of horses of oblique formation have been introduced in large numbers regardless of cost; but, at the same time, there have also been imported animals of the ancient unimproved straight type of formation in numbers sufficient to be equal to the undoing of whatever improvement the other might effect. The common practice hitherto has been to allow these two types to get mixed indiscriminately. So long as this practice obtains, general improvement of our horse stock is not within measurable distance. How to obviate and overcome this bar to improvement in our horses is well worthy the attention of Australian Governments.

Though the monuments of Egypt show that the Egyptian horses of early times were of straight formation—in the light of modern Egyptology—it does not necessarily imply that they remained so during the thousands of years that elapsed from the time of the first drawings of the horse until, let us say, the time of Solomon.

In Egyptology it is a well-accepted fact that, though other arts and sciences made great strides in progress, certain religious superstitions or conservatism prevented the artists from varying the style of their drawings or improving with their additional skill and knowledge on the works and representations of their forefathers. We may therefore safely take it for granted that great improvement had been effected in their horse before Solomon's day (though this improvement remained unrepresented in their drawings).

We may as safely infer that when Solomon put together his ever-famous stud of horses, they were the best that the then known world could produce; that he furnished his stud from Egypt proves to us that Egypt, in his time, had the lead in horse-breeding, and we may rest assured they were the best that could be secured in Egypt.

That the horse had been vastly improved on the sculpture type before Solomon's agents appeared in Egypt as purchasers of the best stamps is, reasoning from analogy, a moral certainty which it would be sheer foolishness to question. The Egyptians, besides being a great war power trusting in their horses as their best arm of war, had also a most thorough knowledge of scientific breeding, which enabled them to establish a red herd of cattle, probably by blending the white European with the black African cattle. They had also raised their sheep to lamb twice a year, while incubating factories were spread over the land, to which the farmers brought their eggs, which when hatched the factory retained one portion of the chicks, the farmers taking away the other. With such a knowledge and system of breeding, it is not at all credible that their war horses would remain unimproved for 2,000 years and more. That that improvement would tend towards Arab lines is also certain, when we reflect that their only means of improvement was by selection of the fittest of their own stock, no better being available. Those horses, developing more obliquity of form, would excel in speed and staying power, covering as they do more ground with less exertion. The most speedy and the best stayers always used for stud purposes would ultimately result in a horse on Arab lines. The long-sustained continuity and uniformity of their methods of breeding was also conducive to improvement.

Had those ancient Egyptians been able to hotch-potch such a medley of sorts as we have done in Australia—South American mustang, London coach horse, Cleveland, Suffolk Punch, Norfolk and American trotters, Shire and Clydesdale, Shetland, Welsh and Timor, Arab and English thoroughbred, and many more, jumbled together, much as the three witches in Macbeth mixed their incongruous and unhallowed ingredients in the chaldron—the question arises, would Solomon's shekels have been left in Egypt in exchange for their horses?

We must logically come to the conclusion that Solomon's agents had a stock of very high-class horses to select from; that this selection was done in such a skilful manner that Solomon's stock subsequently became of greater repute than the parent stock of Egypt; and this is evident from the fact that the Phœnicians afterwards bought from Solomon's stock in preference to Egypt, and no people knew the world's markets better than they did.

In this light the oral tradition of the Arabs concerning the origin and pedigree of their horse seems no longer an extravagant absurdity, but a reality.

That Solomon's love of the horse, and the care he bestowed on them, must have had a great and good effect on the stock he raised, and they on the stock of the countries around Palestine—the native home of the Arab type—we may also accept as certain.

I have already pointed out that history goes to show that all improvement of the horse has been the work of kings and Governments. In the absence of anything in history to indicate any other probable source, we may, on the circumstantial evidence adduced, ascribe the credit of perfecting and fixing the Arab type to the stables and studs of King Solomon.

Poultry.

WEAK EMBRYOS IN EGGS.

THE complaints last year as to death-in-shell were considerably above the average. In some cases the percentage of fertile eggs hatched was lower than recorded for several years. On one farm out of 2,500 eggs put down only 600 chickens were secured. The result was found equally when hens were employed as with incubators, and thus objectors to artificial hatching could not get hold of any special argument to illustrate their views. Probably fertile eggs were less abundant, but I do not think that the trouble was nearly so great in that direction as death-in-shell. It is therefore to the latter that special attention should be given, in order, if possible, to discover the cause thereof.

"ADDLED" EGGS.

Death-in-shell is the term usually employed when the embryo dies during the later stages of development—that is, after it has formed and grown to partly fill the shell. An egg in which the germ dies during the first few days is called an "addled" egg, though this is hardly a correct term. In this case, however, chemical action has taken place more fully and the contents are rotten, whereas there has not been time for this change to have taken place when the chick develops beyond the fourteenth day and then dies. The latter is even more disappointing to a breeder than the former, for though the result in both cases is the same, as he does not secure that which he had hoped, yet it appears worse to lose a bird so near its appearance.

CAUSES.

Probably the cause in both cases is pretty much the same, though it need not necessarily be so. The embryo during its earlier stages is much more easily killed than the chick. Every variation of temperature is felt more rapidly, and has a greater influence upon the former, there being no reserve of heat force, as at a more mature stage. It must not, however, be inferred from this fact that we can treat eggs carelessly at any period, but experience shows that they have a considerable amount of natural vigour after the eleventh or twelfth day of incubation, and can bear at any rate a fair degree and extent of cold. My own impression is that the older an embryo, the less it can stand in the way of heat, but observations have not been made sufficiently upon this point to justify decided conclusions. I have found, however, in more than one instance that a rise in temperature has done less harm before the tenth day than afterwards. But it would not do to accept as authoritative this experience without further experiments. At first it was suggested that the albumen by which the young embryo is surrounded protects it, but this should be equally true in the case of cold.

We must bear in mind that dealing with animal life is not an exact science, and that there are many influences at work which are not understood. It is only possible, therefore, to draw conclusions, leaving them to be modified if needed by further experience. The following suggestions as to the cause of weak embryo in eggs are given in this spirit.

IS THE MALE BIRD AT FAULT.

The most natural assumption as to death-in-shell is that the male bird is at fault. There are great differences in the natural vigour of fowls, and certain breeds are usually regarded as uncertain breeders after they are two years old, more especially the Cochin. But even with more virile fowls the same is true. We are not now, however, regarding cases of this kind so much as where the

germs are weak, without any such explanation being at hand. Frequently it is found that the male bird is out of health, perhaps suffering from some incipient, and therefore unsuspected, disease. The eggs are fertilised, but lack of strength necessary for full development and perfect hatching. Under these circumstances there is nothing to be done but replace the cock by another.

It has been suggested that reduced vitality in the male bird is frequently caused by want of sufficient food, but of this I have had no personal experience. Cocks are as a rule very gallant, calling the members of their harem to feed, and not helping themselves until the hens have had enough. Where birds are kept in confinement, or when the ground is hard with frost, if the food is taken away so soon as the hens are satisfied, without seeing that the male bird gets his share, he would be underfed, which must result in enfeeblement of constitution, with consequent infertility of eggs or weakness of embryos. As a rule this state of things is more to be met with when fowls are kept in confined runs than if they have full liberty.

RENEW THE MALES.

A further cause is due to keeping the male bird too long with his hens, and probably this is the solution of the trouble during the past season. During a mild winter the functions of both cocks and hens are stimulated into earlier activity, which would not be the case in an ordinary cold season. Hence eggs would be fertilised much sooner than usual, and nearly all breeders know that towards the end of a season eggs are less fertile and germs weaker than previously, doubtless due to the reason here given. The plan of running a male bird all through the year is wrong in principle, and those who, about midway in the breeding period, place down a fresh cock, removing that running with the hens up to that time, are doing the best thing possible to secure strong vigorous chickens. It is needless to enlarge upon this point. The fact stated must be obvious to all who study Nature's laws and operations. What should be done is to break up the pens as soon as all breeding eggs have been secured, keep the male bird by himself or with other cocks, and only put him down with the hens about a fortnight before the eggs are to be used for hatching. In case a cockerel is to be mated up, he should be allowed to grow size and vigour as long as possible, and add him to the pen he is to rule at the time already named.—*Agricultural Gazette* (England).

PRESERVED EGGS.

IN Germany systematic experiments have recently been made for the purpose of securing the most rational method of preserving eggs. Twenty methods were selected for these experiments. In the first days of July 400 fresh eggs were prepared according to these methods (twenty eggs for each method), to be opened for use at the end of the month of February. Of course, a most essential point for the success of preservation is that only really fresh eggs be employed. As the most infallible means of ascertaining the age of the eggs, the experimenter designated their specific weight. With fresh eggs, it is from 1.0784 to 1.0942. If the eggs are put into a solution of 120 grammes (4.23 oz.) of common salt in 1 litre (1.0567 quarts) of water, the specific weight of which solution is 1.072, all the eggs that swim on this liquid weigh less, and consequently are not fresh. Only those eggs that sink are to be used for preservation. When, after eight months of preservation, the eggs were opened for use, the twenty different methods employed gave heterogenous results:—

1. Eggs put for preservation in salt water were all bad (not rotten, but uneatable, the salt having penetrated into the eggs).
2. Eggs wrapped in paper, 80 per cent. bad.

3. Eggs preserved in a solution of salicylic acid and glycerine, 80 per cent. bad.
4. Eggs rubbed with salt, 70 per cent. bad.
5. Eggs preserved in bran, 70 per cent. bad.
6. Eggs provided with a cover of paraffin, 70 per cent. bad.
7. Eggs varnished with a solution of glycerine and salicylic acid, 70 per cent. bad.
8. Eggs put in boiling water twelve to fifteen seconds, 50 per cent. bad.
9. Eggs treated with a solution of alum, 50 per cent. bad.
10. Eggs put in a solution of salicylic acid, 50 per cent. bad.
11. Eggs varnished with water-glass (Wasserglas), 40 per cent. bad.
12. Eggs varnished with collodion, 40 per cent. bad.
13. Eggs covered with lac, 40 per cent. bad.
14. Eggs varnished with sward, 20 per cent. bad.
15. Eggs preserved in ashes of wood, 20 per cent. bad.
16. Eggs treated with boric acid and water glass, 20 per cent. bad.
17. Eggs treated with manganate of potassa, 20 per cent. bad.
18. Eggs varnished with vaseline, all good.
19. Eggs preserved in lime water, all good.
20. Eggs preserved in a solution of water-glass, all good.

Thus it appears (says the *Grocer*) that the last three methods are to be considered the best, and especially the preservation in a solution of water-glass, as varnishing the eggs with vaseline takes too much time, and the treatment with limewater sometimes communicates to the eggs a disagreeable odour and taste. The drawback with eggs preserved in a solution of water-glass is that the shell easily bursts in boiling water; but it is said this may be avoided by cautiously piercing the shell with a strong needle. And now, having got thus far, we suppose the idea will be followed up energetically, until grocer and consumer alike are at the mercy of the egg-preserver.

The Orchard.

THE VELVET BEAN.

By ALBERT H. BENSON,
Director Experiment Farms.

ALTHOUGH notes on this plant have already appeared in the *Queensland Agricultural Journal* for August and October, 1897, I think that the following information respecting its growth in this colony may be of interest to Queenslanders, as the previous notes were simply extracts from American journals, and the information they gave was more applicable to American than to Queensland conditions.

In the first place the plant has been wrongly named, as it is not *Dolichos multiflores*, but is recognised by Mr. F. M. Bailey, to whom I submitted specimens, as *Mucuna pruriens*, var. *utilis*, a variety of the plant commonly known as "Cowhage" or "Cow-itch."

The description already given of this plant is substantially correct, so I will simply refer my readers to the illustration herewith, which has been drawn by the artist to the Department from a plant grown at the Redland Bay Experiment Orchard.

Last spring I received some twenty seeds of this bean from Mr. G. M. McKeown, then manager of the Wollongbar Experiment Farm, near Lismore, N.S.W.; fourteen of these seeds were planted at Redland Bay and the balance were handed to Principal Shelton, and planted at Gatton College Farm in deep rich alluvial land, on the bank of Lockyer Creek, where they are doing very well.

The soil at Redland Bay on which the beans were planted is a deep loam of a red colour, originally covered with heavy forest; but for a number of years under bananas, and for the last three years under fruit trees. The surface soil has been somewhat exhausted by the banana culture, and from its appearance and the nature of the crops it produces, is deficient in organic matter and nitrogen, and probably in potash as well.

The land has good natural drainage, but like most of the red loams of the colony that are of volcanic origin, it does not scour well, but sticks to and clogs all implements used for ploughing or cultivating.

The following information respecting the preparation of the land, planting, and growth of the beans has been supplied to me by Mr. James Henderson, the manager of the Redland Bay Experiment Orchard:—

"The soil was ploughed to a depth of 8 inches and twice harrowed before planting.

"The beans were planted on the 2nd of November, at a distance of 4 feet apart in the row, and every second bean was manured with a bucketful of stable manure, forked into and mixed with the soil before planting.

"The beans were staked with strong stakes 5 feet out of the ground, with a light stick on top between the posts; but this was found to be totally inadequate, as it was unable to support the weight of the plants, or to resist the force of the south-easterly winds, with the result that the beans were blown down four times. On the first occasion (9th January) three of the plants were broken off at the ground, but grew again, and are now (31st March) as large as any of the others. The beans, despite the rough treatment they have received, have made a heavy growth, have bloomed profusely, and are now covered with a heavy crop of unripe beans. As far as can be seen, there is no



(*MUCUNA PRURIENS*, var. *UTILIS*). THE VELVET BEAN.

A. Foliage and raceme of Beans.

C. Bean or Seed.

B. Pod. Natural size.

D. and E. Front and back views of Flower.

difference between the manured and the unmanured plants, at any rate as far as the growth is concerned, thus indicating that the plant is largely an atmospheric feeder, and, therefore, admirably adapted for green crop manuring. From the time of planting (2nd November) to date (31st March) rain fell on 68 days, the rainfall at times being heavy and continuous."

In order to compare the growth of various leguminous plants used for green crop manuring with that of the Velvet Bean, the following varieties were planted at Redland Bay, viz.:—

Vigna catiangu.—Cow-pea, black and clay-coloured varieties;

Phaseolus lunatus.—Tall Lima Bean;

Phaseolus lunatus, var. *inamœnus*.—Horticultural Lima, or Madagascar Bean;

Dolichos lablab.—Madagascar, Tonga Bean, or Lablab;

Dolichos purpureus.—Poor Man's Bean;

and two varieties of Mauritius Beans obtained from the Colonial Sugar Company, and used by them for green crop manuring in Northern Queensland.

The Cow-peas and Lima Beans did not do well, their growth being very indifferent, and none of the other beans made as rapid growth or fruited as early as the Velvet Bean.

The Poor Man's Bean and the smaller seeded of the two Mauritius Beans have made very heavy growth, but are not yet in seed. Both varieties seem to do well on the ground, but the large black Mauritius Bean, though making a heavy growth, appears to do best when trellised. A full description of these beans will be given in the *Journal* when they have fruited.

These results seem to indicate that in the Velvet Bean, should it turn out to be as rich in nitrogenous matter and to be as good a fodder as it is stated to be by American writers, we shall have a valuable plant for this colony.

We have not tried it with stock as yet, as it is not ready, but when made into hay and then chaffed it should be equally as good as cow-pea, and the latter, when judiciously blended with wheat, oat, corn, or sorghum chaff, is one of the best feeds for all kinds of farm stock. When required for green crop manuring it will probably be best planted in rows from 4 feet to 6 feet apart, and the beans from 2 feet to 4 feet apart in the row, as from the growth it has made at the Gatton College and at Redland Bay it evidently requires plenty of room. When required for seed, however, I advise its being planted alongside of a rail fence, or being trained on a framework of saplings as it is likely to produce much more seed if kept off, than if allowed to run along the ground. I hope to have a few seeds for distribution, and anyone who receives three or four seeds should be able to produce enough seed next year to give them a good start, if the beans are properly planted and taken care of. The supply of seed will necessarily be very limited, as we have only fourteen plants in fruit, and we shall require a certain quantity for seed for our Experiment Farms in order to further test the adaptability of the plant to various parts of the colony, and to keep up a supply of seed. An analysis of the plant—root and top—to determine its actual manurial value, and an analysis of the soil on which it is grown, will be made, and will be issued in a subsequent number of this *Journal*.

OLIVE CULTURE.

Mr. E. NEVILLE-ROLFE, British Consul at Naples, in a report to the Marquess of Salisbury on olive culture, gives the following interesting information on the cultivation of the fruit in Italy. We give the report in its entirety, as it will doubtless be read with interest by all Australian cultivators from Perth to Cooktown:—

ORIGIN OF THE OLIVE.

It is certain that the greater part of the Mediterranean littoral was in ancient times, as it now is, the home of the olive, and of all the countries which claim the tree as indigenous Italy is that which is the chief of the oil-producing countries of the region. And in Italy it grows upon a great variety of soil, and in a fair variety of climate. It is found wild on the scorching and rocky hills near Taranto, where it grows from seeds which have probably been carried from place to place by birds, and casually deposited in some fissure where sufficient soil has been found to nourish the young plant, for birds are extremely partial to olives; indeed in the southern provinces of Italy, where the large migratory thrush, so heartily praised by Horace on his journey to Brundisium, still abounds, we find the expense of gunpowder for birdscaring a considerable item in the olive-growers' accounts. The cultivated olive, too, is a tree which is very independent of soil, and may be seen growing on a rocky hillside or on the deep soil of the plains, and flourishing as well in the one situation as in the other.

OILS OF LUCCA AND BARI.

The small province of Lucca has given its name to the finest table oil in the world; and though the best oils of Bari in this district compare favourably with it, they have not the same celebrity. In point of quantity at least this consular district is far ahead of the rest of Italy, as will be seen by the following figures:—

PRODUCTION AND EXPORT.

The total amount of olive-ground in Italy is officially estimated at 908,072 hectares (a hectare being roughly $2\frac{1}{2}$ acres), of which 492,430 hectares, or more than half the total, are in this district. The total produce of oil is reckoned at 3,350,143 hecto-litres, of which this district yields 1,934,948, or more than half of the produce of the whole kingdom. Of the South Italian oils those of Bari have the greatest repute, and many of the trees are of very great antiquity. The annual export of oil from Italy amounted in 1888 to 63,500 tons. A very large proportion of this export goes to the British Empire, and though no doubt the importers care little about the methods of the cultivation of the tree, as compared with the market price at which they can purchase the oil wholesale, the cultivation is an important item to British trade, because a determined effort is being made to introduce the tree both into South Africa and the Australian Colonies. The plants are being sent out in considerable numbers from Naples, chiefly, if not solely, by the firm of Messrs. Dammann, of Portici, a suburb of Naples, who have also charged themselves with the introduction of the Karob into South Africa.

USES OF OIL.

It is unnecessary to mention the variety of uses to which olive oil is put, but it may be interesting to note that large quantities are used on sheep-runs in the colonies for sharpening the clippers at shearing time. Time alone can show what success the introduction of the tree will have in our colonies. It may be that the best oil will be produced; it may also be that only the lower class oils, such as those grown in Turkey, which are only useful for making soap, will be manufactured, but at any rate a useful lubricant will be obtained, and a very picturesque tree added to the landscape. In the meantime a report in English on the cultivation of the plant cannot fail to be of service.

THE OLEASTER.

The wild olive or oleaster is a tree of small and stunted growth, and yields a fruit from which very little oil can be procured. The grafting of the oleaster was known in very ancient times, and is mentioned by St. Paul in his Epistle to the Romans, who, however, for the reasons of his metaphor, or perhaps from ignorance of arboriculture, reverses the process, and describes the oleaster as being grafted on the olive, whereas, of course, it is the cultivated tree which is

grafted on the stem of the wild one. The oleaster can be raised from seed in the ordinary way, or it can be raised from the fungoids which olives bear underground at the point where the roots separate themselves from the trunk.

OLIVE WOOD.

Olive-trees live to a very great age, and their wood is very useful for cabinet-making, as it is hard as well as pliable, and can be easily manipulated. The smaller boughs form excellent fuel, for owing to the oil in them they burn like a torch; and as the trunks of old trees are apt to become hollow, many of them are only fit for the same purpose. The tree is evergreen, and the leaves fall after about three years, being of course constantly replaced in the course of nature by younger ones. The olive commences to flower at the base of its foliage, the flowers gradually extending upwards. The best crops are always obtained when the trees flower early, and this occurs (when the spring is mild) as early as the month of March*; but the tree is susceptible to cold, and if it gets checked it will flower as late as June,* in which case a failure of the crop may be anticipated. Old trees usually yield a crop only in every alternate year, which is gathered in the autumn and early winter. The largest trees are found in Sicily, where they grow almost like oaks, and may be found measuring 25 feet round the trunk.

VARIETIES.

The Italian Blue-book on agriculture published in 1874 names 300 varieties of the tree as existing in Italy, of which sixty-seven are found in this consular district. Obviously, in a country like Italy where so many dialects are spoken, in many cases the names of these varieties are purely local; and as the same variety is called by one name in Tuscany and by another at Naples, it would be absolutely useless to mention distinctions which have no difference, in a report written for British readers.

CLASSES OF OLIVE.

Olives are in fact divided into three classes, namely:—(1) the small olive with few leaves, which grows freely, resists the cold better than the others, is more free from disease, grows on the poorest soil, and, though generally very hardy, does not yield good oil, and is useless for table purposes. This tree will yield oil good enough for sharpening shears and for mechanical purposes generally, and it will grow almost anywhere. It is known by the names of Miguda, Trillo, Cerisiola, and Martino, in Italy. The second class, known as Olivi di Spagna, has larger leaves, a large and succulent fruit adapted for table use, subject to the necessary treatment. These trees require rich and good soil and no great vicissitudes of temperature; they will not bear cold, and are subject to a good many diseases. If they get chilled the fruit falls, and such berries as remain give but little oil, and that of poor quality. These varieties are supposed to have come to Italy from Spain, and to have found a climate in Italy which does not always agree with them. They might all the same do well in the warmer climate of Australia. The third class is preferable for general cultivation, as it avoids both extremes, being hardy and at the same time producing a good and useful crop. These are known in Italy by the names of Razze, Corniola, Ogliarolo, Pigudo, and Monopolese.

CLIMATIC CONDITIONS.

Like the palm, the olive will flourish in many places where it will bear no fruit. It will not yield in very hot places, and it will not endure frost or sudden transitions from cold to heat; it does not mind sea air, and in many places on the Mediterranean it grows to the water's edge, where it must often be affected by salt and spray. Twelve degrees centigrade below zero (10·4 degrees Fahr.) is enough to wither the leaves and to kill such roots as are on the surface. A late spring frost is naturally more harmful than a winter one, and damp cold than dry—conditions which apply to all evergreen trees. In this district the altitude at which olive-trees can be found may be reckoned at

* March and June are the dates of flowering in Italy.—Ed. Q.A.J.

1,500 feet above the sea-level. As a rule they thrive better on hills than in the plains, because any cold they are subjected to is less damp in the former situation than in the latter. In a temperate season the trees in the plains will bear better than those on the hills. With regard to exposure: In this climate the east and north are preferable, as affording less sudden changes than the southern and western exposures, but south of the "line" the conditions would be different or perhaps reversed; the main point to be considered being to give the trees as equable a temperature as possible, and to avoid frost and violent autumn winds, which are apt to shake down the berries.

MANURE.

Olive-trees are the better for manure, but the kind of manure used depends, as will be seen, very much upon the nature of the soil in which the tree is planted. Farmyard manure, if well decomposed, may be placed in trenches round the trees, but special care must be taken to put such trenches far enough away from the trees, so that the roots are not mutilated by the digging, as they are particularly susceptible to injury from this cause. It is a good plan to soak the husks and refuse of the oil presses in water till they have thoroughly rotted, and then infuse manure and other decaying vegetable matter in the water before placing it in the trenches. Too much manure should not be given at one time, little and often being the golden rule. Of artificial manures, soda is that most frequently used. Lime and silica are necessities, but care must be taken in applying them that they are not already existent in the soil in sufficient quantities, as if they are abundantly present more harm than good will be done by their application. Wood-ashes and phosphates may safely be mixed with the manures used. The autumn is the best season for the application, as the manures get incorporated into the soil during the winter, and serve to feed the roots more plentifully in the spring. Most trees are the better for being manured annually. Green crops for sheep-feeding or cabbages can be grown between the trees without injuring them.

DEAD TREES, SHOOT FROM.

It will be many years before any olive-tree in the colonies falls from age, or, being mature, dies a natural death. When a tree dies it can be sawn off above ground, and, if the roots are still alive, they will throw out offsets. If these are attended to, and the bottoms of them well covered with earth, they will throw out rootlets, and, when these are well grown, the shoot can be cut off with its roots and put into the nursery. One or two good shoots should also be left on the old trunk, as they will throw up and form useful trees. They will require grafting in due time. Where the wild olive-tree grows, it is a simple matter to transplant it and graft it, but this will not occur in the colonies for many years to come.

SEEDLINGS.

The olive will also grow from seed, and this, in fact, though it is a slow process, is in the end superior to any other. The trees do better, live longer, and are much less liable to disease than those propagated in any other way. The seed will germinate in the second year if left to itself, but, if it is softened by being placed in a pap of clay and cow-dung, and sown thus, it will germinate the same year. It is necessary to sow in thoroughly clean ground, so as to allow a free and prompt expansion of the rootlets. The ground should be dug 3 feet deep, thoroughly cleaned, and richly manured. This should be done in the winter, and in the spring the surface should be laid out in shallow trenches, in which the seeds should be sown in rows about a foot apart, with a distance between the seeds of not less than 6 inches. The sharp end of the seeds should be upwards, and they should be treated with a fair amount of water. It is especially essential that the ground should be kept clean, and all weeds immediately removed. In the spring of the third year the seedlings may be removed to the nursery, all shoots appearing on the tiny trunks having been carefully removed.

PROPAGATION BY FUNGI.

The most usual way of propagating the olive is by means of an egg-shaped fungus growth, which is found upon its roots. It is about the size and much the shape of a turkey's egg, and grows outside the bark. Not more than two of such fungi should be removed from a single tree, or damage will be done to it. Indeed, if propagation is attempted on a large scale, it is better to sacrifice one tree altogether than to run the risk of injuring a greater number. Thus a hundred or more of these fungi can be obtained from a single tree in the winter, besides a greater number of slips and grafts in the spring, when the tree can be felled and disposed of. The removal of the fungus must be done with care. The wood of the root round it must be carefully sawn or chipped with a sharp axe. A chisel must then be used to undercut the fungus, and finally lift it out of its place. The wood which adheres to it can then be cut off with a sharp knife. If the fungus has plenty of eyes, it may be cut up like a seed potato, but it is always advisable to make the pieces so large that each piece should have three or four "eyes." If the fungus has made any roots, these should be carefully removed. The best time to take them is in the winter, before the sap begins to rise, and they can be kept till the spring in dry earth, mixed with chaff to soften it. They should be planted in March.

PROPAGATION BY CUTTINGS.

The only remaining method of propagation is by cuttings. These should be about 18 inches long, of which 12 inches should be beneath the surface. The thickest or lower end of the cutting should be cut into the shape of a wedge, and it should be well daubed with cow-dung and covered with garden mould. It can then be planted, care being taken in making the holes not to twist the rod which makes the hole; otherwise the sides of the holes become hard, and the rootlets do not get a sufficient chance of expansion. Cuttings with boughs to them are treated in the same way, save that the cutting is laid in the ground horizontally, but with the thick end lower than the other and the boughs allowed to protrude above the surface. In a year's time the part beneath the surface will be furnished with roots and the boughs with leaves. The whole thing can then be taken up, each bough separated from the other, and the cuttings placed in the nursery.

GRAFTING.

The oleaster is grafted in the same way as other fruit trees—namely, either by sawing it off and inserting two or three grafts between the bark and the trees; or by cutting a slit with a transverse cut in the shape of a T, opening up the bark and inserting the graft; or, again, by cutting away the bark and a portion of the wood from the bough and the graft, making a point of contact of about half-an-inch, and then binding them strongly together with wool, and covering the point with a mixture so as to seal it hermetically. All shoots which occur below the graft should be cut off.

The following is a useful mixture for the purpose of grafting:—

						Per Cent.
Black Swedish pine	...	...	...	...	...	28
Burgundy pitch	...	...	...	...	...	28
Yellow wax	...	...	...	...	...	16
Lard or tallow	...	...	...	...	...	14
Ashes	...	...	...	...	...	14
Total	...	...	...	...	...	100

NURSERY.

Much need not be said about the nursery, as this part of the subject is influenced by local conditions which are known on the spot, and may perhaps differ materially from conditions prevailing in Europe. It will be useful to mention that the ground in the nursery should not be too rich, because, if it is, the young plants form far fewer roots to feed themselves with than will maintain them in a poorer soil, and hence they get a serious check when they are moved to their permanent home where the soil will naturally be poorer than that of the nursery. If, on the other hand, they have been grown in comparatively poor soil they will have made more roots, and will move much better. In whatever way the trees are propagated, they should remain eight years in the nursery before going to their permanent home. In the case of plants grown from the egg-like fungus, a certain amount of careful cultivation is necessary. About six weeks after they are planted, shoots like asparagus heads will appear. In order to give these every chance, the ground above them must be kept loose, and if it has become dry and caked it must be watered. From each piece planted some half-dozen shoots will rise. Of these only the vigorous straight ones should be preserved; the rest should be carefully pinched off below the surface with the finger and thumb, care being taken not to move the plant, which by this time will have made tender rootlets.

PRUNING

Not more than two shoots should be left, and these should be trained to sticks. Later on the less vigorous of these should also be removed. The training of all shoots, whether from cuttings, fungus, or any other means of propagation, is most necessary. At first, they can be trained to canes or small sticks, but when they begin to make a top it will be necessary to support them with a stout stick, and to continue this support till they have thoroughly taken root in their ultimate home. On hot dry soils, such as will generally prevail in Australia, it is desirable to keep the trunks short. Hence in grafting they should be sawn off from 3 to 4 feet above the ground level. In fertile soils in Italy, the height is left at as much as 5 feet, but in arid soils the rule is "the shorter the better." The fewer boughs left on the stem the better. Some growers cut them all off, but the effect of this is to delay the fruiting of the tree by a year or so. Whether it answers in the long run is a point much disputed, and not very easily capable of proof.

PLANTING

Olive-trees should be planted not less than 20 feet apart in ordinary soil, but where the soil is good this will not be sufficient, and 40 feet is a safer distance. The holes should be 3 feet deep and 3 feet over, and where the soil allows of it they should be dug two or three months before they are wanted, as exposure to the sun and air is found to fertilise the soil taken out of the holes. It is desirable to put stones or dry rubbish in the bottom of the holes for drainage, and if the land is damp it will be necessary to drain it; consequently ground with a good fall should always be selected. The best manure consists of the scrapings and fragments of horny substances and ground bones. Deep planting is not recommended, and the trees should be set about 6 inches deeper than they were in the nursery. The shoots should be pruned in order to stimulate the roots, and a trench or cup left round the tree to collect rainwater. If the following season should be a dry one, it will be necessary to water the plants copiously. All shoots that appear on the trunks should be taken off at once, unless they are so situated as to eventually form part of the top of the tree. The best way to take them off is to rub the tree down with a piece of canvas. This not only removes the tender shoots, but prevents the trunks from accumulating lichens and mosses. All plants do not sprout in their first year; it is therefore important to make sure that any plant is dead before taking it up. For three or four years the plant should be left quite alone, after which the weaker boughs should be cut away, care being taken that

those which are left are as symmetrical as possible to ensure a handsome top to the tree. Boughs can, of course, be pruned and trained into their places if necessary. It is better also to remove roots which are too near the surface, as they prevent the development of the lower roots, which are essential to the tree. In the fifth year pruning should be carried out. The dead knob above the grafts should be carefully sawn off obliquely with a sharp saw, and the place covered over with the pitch composition given above to prevent the tree from bleeding. The top should then be carefully pruned, so as to secure a shapely tree.

PROPS.

As the tops will now be getting heavy, the trees require more support to save them from the wind which otherwise would displace the roots. Three props should be put to the trunk of each tree, and at the point of contact the tree should be protected by a band of straw, so that the props may not chafe the trunk. It is also necessary, when winter comes on, to bank up the trees by making a trench round the roots, and throwing the earth up against the stem. This must be levelled again in the spring, leaving a circular trench on the upper side of the tree to collect any rain that may fall.

From this time onward the pruning of the trees becomes very important, and should be attended to every year as soon as the crop is gathered. It must be remembered that the vertical shoots of an olive do not bear fruit, and that no shoot bears fruit in its first year, so that care must be taken to distinguish between the second-year shoots and those of the first year. Unless the trees are properly pruned, the fruit will be small, will give very little oil, and will only yield every other year, whereas with proper pruning the trees may be made to yield every season.

PICKING.

The fruit should be hand-picked, or allowed to fall from the tree on to a canvas or sacking spread beneath it. The boughs may then be shaken, but the tree should on no account be beaten, as this knocks it about and injures the shoots, which will, if left unharmed, bear fruit in the following season. The egg-shaped fungus which we have already mentioned as appearing on the roots of mature trees should immediately be suppressed upon young trees. They should all be carefully cut off as soon as they appear, as they take too much out of a growing tree. Local experience alone can decide the best methods for a particular locality, but it may be accepted as a principle that vertical shoots may be taken off, all dead wood removed, and branches which have borne much in the preceding year cut back to allow more nutriment to pass to the others. Too many buds should not be allowed on any branches.

ENEMIES OF THE OLIVE.

Like other fruit trees, the olive has many enemies. Besides the birds we have mentioned, who occasionally atone for their thefts by producing what we are pleased to call "self-sown oleasters," there are numerous insects which attack the fruit, the wood, and the leaves.

DACUS OLEÆ.

The most dreaded of these is a small fly called the *Dacus oleæ*, which is about half the size of a common house fly. It has a yellow head and green eyes, and an ashy-grey back with gossamer wings. The female has a spur like a wasp, with which she punctures the fruit and deposits an egg in the lesion. It is calculated that a single fly will thus destroy 300 or 400 olives. These eggs develop into larvæ, which completely tunnel the olive, leaving nothing but the outer shell and the stone. In about a fortnight they assume the chrysalis stage, and about ten days after that the perfect fly issues. This, it will be seen, displays an alarming fecundity combined with an extraordinary rapidity of reproduction, and in favourable seasons terrible damage is done. The only known remedy is to gather the fruit early, and by crushing it at once to destroy the larvæ.

COCCUS OLEÆ.

The *Coccus oleæ* is the enemy of the boughs and leaves. It is a parasite, which at first sight appears to be a portion of the branch upon which it grows and upon the sap of which it lives. It also develops a fungus which blackens the boughs. Lime-washing and petroleum have both been tried with some measure of success against this pest.

Some growers burn damp straw under the trees in order to fumigate them and destroy insect life, but this must be done with great caution, as the olive is a tree from its nature very easily scorched, and very much damaged by scorching both in fruit and foliage. It is not desirable to allow lichen or moss to grow on the bark, as it affords a refuge for parasites and a home for the eggs of insects.

It is, however, reasonable to express the hope that the olive-tree when introduced to its new home in the Antipodes will leave all these enemies behind it, and not find new ones to contend with, so that it may grow and prosper till it has bestowed wealth on the Australian continent in the same abundant measure as it has lavished it on the Italian Peninsula for so many centuries.

 THE FIG.

FROM a report lately received from Mr. W. Finucane, Commercial Agent for Queensland in Europe, on the fig industry near Smyrna, in Asia Minor, we make the following extracts:—

I was successful in obtaining 100 suckers and 100 cuttings of the Wild Fig (for caprification purposes). . . . As to the caprification of the domestic fig, for which purpose I forward the 100 cuttings and 100 suckers, I need say very little, as the Department of Agriculture is well acquainted with the process. All the contents of the boxes are of the wild or Capri kind; I have not been able to send any cuttings of the domestic fig because a sharp frost had bitten the tips on all the trees, and cuttings of the domestic kind should be planted with the tips on from which they sprout. To procure them it will be necessary, I find, to be in the Aidin district about a month earlier than I went, so as to be there before the frosty weather comes on. I regret very much that my mission to Asia Minor has been somewhat incomplete; I hope, however, that what I have sent will reach the colony safely, and will result in the acclimatisation of the Capri fig.

FERTILISATION.

Fertilisation takes place when the fruit is one-third the size it will attain when ripe, and to prevent the fruit dropping prematurely, and to hasten its ripening, caprification is resorted to. It consists of placing the wild fig among the branches of the domestic one. Wreaths are made by stringing loosely on pieces of rushes from two to twelve wild figs, according to the size of the tree upon which the wreath is to be placed. The peasant takes a basketful of these wreaths and flings them into the branches, where they remain. The insect which infests the wild then leaves it and enters the domestic fruit by the orifice. This is the process which is called "caprification," and it is undoubtedly this action which prevents the domestic fig from dropping before maturity, and makes it grow large. There are of course many proofs in support of this theory, but the most recent and authentic one which I have heard is from the lips of Sir Edwin Egerton, the British Minister at Athens, a gentleman who takes a considerable amount of interest in matters of this kind. Sir Edwin told me that there is a fig-tree in the Embassy garden, the fruit from which always dropped prematurely. He procured a wild tree and planted it in the garden, and when it bore fruit he followed the caprification practice. Since then the fruit remains on the tree, not only until quite mature, but actually until half dry.

SOIL.

The soil in the Meander Valley, where the fig of commerce grows, is, owing to its position, very loose, and very deep, and has the advantage of retaining moisture. Many opinions have been advanced to me why this valley is so adapted for this peculiar kind of fig, one being that the tree requires moisture, and the character of the soil is such that it retains it. Another, that the valley is sheltered, which is the case; it is surrounded by mountains. Another, that the soil contains a certain amount of sweetness, as a proof of which is instanced the immense quantity of Liquorice it produces. It is impossible, to my mind, to arrive at any correct conclusion, because cultivation is carried on so recklessly and stupidly that it is difficult to say what are the precise advantages from which the tree profits.

CULTIVATION.

The cultivation as conducted by the natives is bad. The soil is badly tilled, the trees badly grown, they are untrained, and the suckers which grow off the parent tree, under the delusion that they add to the producing power, are fastened on to the tree. No doubt this gives a greater bulk, but it is not agriculture. Rules as to drainage are utterly disregarded; the fig may require much moisture, but a certain amount of drainage is also necessary. I have seen a whole plantation flooded with rain water for want of escape, simply because the natives are too lazy to form the ground properly. All Englishmen to whom I have spoken agree with me that the impressions which I formed as to the slovenliness of the peasants are quite correct, and I am certain that as a consequence of bad cultivation the fig has deteriorated. The skin is leathery, and the flavour poor. The fact is, Nature has done so much in Asia Minor that man is not inclined to exert himself.

RAINFALL.

The rainfall at Aidin* for the twelve months from July, 1895, to June, 1896, was 21.71, and from July, 1896, to June, 1897, was 26.45. In ordinary régime July and August are rainless in all the country from Smyrna to Ortakchi. If there is rain, as, I am informed, there was this year, it is not seasonable for the fig, and if there is rain early in September it is damaging, inasmuch as it prevents the completion of the drying and interferes with the despatch of the fruit in its best condition.

TEMPERATURE.

The temperature in the shade runs freely to 90 degrees Fahr., any time in June to August, and with north-easterly winds to 95 degrees to 100 degrees occasionally. In winter it runs as low as 45 degrees to 50 degrees. I have not been able to obtain complete data as to the temperature, because no record is kept, but I am informed by the British Vice-Consul at Aidin that the above is a correct estimate.

PRODUCTION.

I have been informed by the Director of the Railways that his lines have carried this year to port (Smyrna) over 30,000 tons of figs; this, of course, does not represent the whole production, which this year was below the average owing to unseasonable rains, for immense quantities are carried by the caravans. besides the enormous consumption in the country. Apart from the fig, which is the staple product of the country, corn, maize, barley, oats, millet, and all cereals are grown. All fruit, excepting tropical fruit, grow; the date palm is grown but does not bear fruit owing to too much cold in winter.

Aidin is a Turkish village eighty-one miles from Smyrna, in the heart of the fig-growing district.

LIQUORICE.

Enormous quantities of the liquorice root are dug out of the ground in the Aidin district. Messrs. McAndrews and Forbes, of London, have an establishment where they collect the root, pack it in bales, and export it chiefly to the United States, where the juice is used in the preparation of tobacco. I see no reason why the production of liquorice should not be made an industry in Queensland. All that it requires is, after digging up the roots, to cut them in suitable lengths, pack them in a kind of wool-press, and they are ready for export.

CONCLUSION.

The importance of the colony entering into the fig cultivation cannot be over-estimated, when it is remembered that the cost of experimenting is not very great. Any farmer can grow a row of trees on the margin of his allotment in much the same way that in Italy trees are grown along the border of land carrying cereals, adding very much to the effect of that beautiful country. There are parts of the country in which I am sure the fig will succeed, and if once we are successful it will be a source of great wealth to the colony. The Smyrna fig is deteriorating, as I have already said, owing, I suppose, to cultivation; and if the colony obtains a footing in the markets of Europe, Asia Minor will have reason to regret its lethargy. The countries which mostly draw the best quality of figs, those called Elemes, are the United States and Germany. Those who wish to go into this industry can see a very fine fig tree at Dunwich, in front of the superintendent's house. I believe Mr. Hamilton planted it, at all events he cultivated it, and it is a credit to him. It is the best fig tree I know of in the colony.

SAN JOSÉ SCALE.

It is said that this dreaded scale has been discovered in Victoria on the Eucalyptus trees, an inspector in that colony having discovered it near Wangaratta on some gum-trees. If this report is correct it is a subject for alarm, as there can scarcely exist any means for destroying it in the bush and in scrub unless it be by the fortunate discovery of some enemy of the scale which will attack it in its own strongholds.

A WARNING to which *The Times* (England) gave utterance nearly four years ago as to the necessity of exercising vigilance lest the San José scale-insect should get introduced into this country, through the medium of American fruit, has been justified by last week's events in Germany. As has been announced in our columns, the German authorities, as the result of the discovery of the scale in a case of imported apples, have felt it necessary to prohibit the entry of fresh fruit from the United States. It is quite possible that the scale may have reached this country. It is perhaps the most formidable of all the insect pests that American fruit-growers have to contend with. Its systematic name is *Aspidiotus perniciosus*, and the creature is closely allied to the Mussel Scale, *Aspidiotus conchiformis*, which not uncommonly infests the bark of our apple trees in this country. The white woolly scale sometimes found on our currant bushes is another member of the same family. Assuming that the San José Scale has reached North-west Europe alive, as the action of the authorities in Germany would appear to indicate, it still remains to be seen whether the creature can acclimatise itself. We may recall that neither the Colorado beetle nor the Hessian fly—both, it must be admitted, far removed in relationship from the scale insects, and probably less capable of adapting themselves to a change of environment—ever obtained much foothold in this country. Nevertheless, the whole history of the San José Scale, so far as we know it, indicates it to belong to that class of pests for which prevention is in every way better than cure.

Viticulture.

MR. E. H. RAINFORD, Government Viticulturist, has furnished the Department of Agriculture with the following very valuable report on his recent tour through the viticultural districts of the colony, when he closely investigated their capabilities, the system of wine-making at present in vogue, and all other matters connected with the industry:—

CONDENSED REPORT.

My round comprised the districts of Roma, Mitchell, Stanthorpe, Warwick, and Toowoomba, and I will deal with each separately, and in the above order.

ROMA.—The soil of this district is, generally speaking, a sandy loam with occasional ridges of almost pure sand; a subsoil of yellow clay mixed with sand and apparently permeable to water underlies the whole at a depth of from 1 to 4 feet. Some of the proprietors have chosen the sandiest ridges for planting their vines, apparently under the impression that this soil is most suitable for the purpose. No greater mistake could be made. The vine likes an open soil it is true; but it also requires nourishment and plenty of it, and a soil composed of three parts of siliceous sand is eminently unsuited for a vineyard. The vine for the first few years makes a great show consequent on the rapid extension of its root system and absorption of available nutriment, then a period of decline arrives as the roots find less and less to feed upon, until the vine becomes chlorosed and a prey to fungoid pests, consequent upon their want of vitality and power to resist disease; this was observable in one or two vineyards in this district.

The quality of the wine grown on these sandy ridges is equally defective, the must being poor and of low saccharine density, which, if left to itself, would make a wine of low alcoholicity and small keeping powers; to remedy this defect the wine-makers have been accustomed to raise the density of the must by the addition of sugar, or to fortify the wine with alcohol to preserve it, either proceeding being contrary to the production of good natural wine.

As a proof of the poverty of these sandy soils, I made comparative tests of the must from grapes picked by myself in the vineyards of varying quality of soil, with the following results:—

Vineyard No. 1, sandy ridge, at Roma, gave a must of the density of 9 degrees Baumè, or 14·8 per cent. of sugar.

Vineyard No. 2, at Mitchell, sand and loam, gave a must of 9·25 degrees Baumè, or 15·5 per cent. sugar.

Vineyard No. 3, at Roma, less sand and more loam, gave 10 degrees Baumè, or 17 per cent. sugar.

Vineyard No. 4, at Roma, nearly identical in soil composition to the last, gave same saccharine density.

Vineyard No. 5, at Roma, still less sandy, gave a density of 10·25 degrees Baumè, or 17·5 per cent. sugar. A few other vineyards I was unable to proceed to, but was informed by a local purchaser that the grapes rarely exceeded 9 degrees Baumè, or 14·8 of sugar, and these were of the sandy ridge class.

The trials were all made on the same grape, the Black Cluster, and not yet ripe, so the above densities must not be taken as indicative of the full strength of the musts made on the above-mentioned vineyards—these tests were sufficient for comparing one with another. We have, by these tests, positive proof of the inadaptability of the sandy ridges for

Viticulture, and that the admixture of loam in greater or less quantity at once increases the saccharine density in proportion. It was also obvious that the vines were far healthier in the loamy soil than on the ridges, the vegetation being stronger and of a healthier colour.

The varieties of grapes grown in this district are numerous, and some ill-adapted for wine-making; possibly they are planted with an eye more to their yield than the quality of wine made from them; some of them, as the Mataro and Doradilla, are now in South Australia being torn up or grafted with better kinds, as the wine made from them has turned out unsatisfactory, and the wineries care only to buy such grapes as the Shiraz, Carbenet, and Riesling, &c., paying for the latter much higher prices. In the case of an extension of vine-planting, attention should be paid by vigneron to the propagation of the best varieties only; it costs no more to cultivate a good grape than an inferior article, and the value is greater to the cultivator whether he makes the wine himself or sells his grapes.

More discrimination is wanted also in the planting of table grapes. In one case the vineyard resembled a botanical garden more than anything else—wine grapes, table grapes, red and white in endless variety being mixed up in confusion.

In some instances I found wine made of satisfactory quality, which would, in my opinion, compare favourably with many of the wines of the southern colonies, and would meet with a ready sale in England if supplied at a reasonable price. The defective arrangements of some cellars, however, require much improvement, and it is a matter of surprise that the wines are as good as they are.

Other wines, however, are spoilt and made undrinkable by the addition of sugar to sweeten them, and inferior spirit to fortify them. By doing so the vigneron completely mask the finer qualities of the wine, and turn it into a kind of grog—and poor grog at that. The excuse for doing so is that there is a demand for that class of “wine” (apparently a large demand) which must be met, and that it pays better than making clarets or hocks. Even so, the “wines” could be made less coarsely and of more salubrious ingredients.

Another cause of the poor quality of some of the wines lies in the habit some growers who sell their grapes have of too long pruning the vines to obtain as large a crop as possible and vintaging early before the grapes are fully ripe to avoid risk of damage by rain, so that must is produced of low density and quality, which must be sugared and spirited to prevent spoiling. The buyers have a remedy for this by combining and refusing to take the grapes under a certain density, as is done elsewhere, but they appear to be indifferent about it.

MITCHELL.—The soil of this district is poorer than that of Roma, and the subsoil would appear to be less permeable to water; a visit to several vineyards has convinced me that it is not adapted for wine grapes. In many places the vines were chlorosed from want of nourishment, and the grapes attacked by anthracnose, there being little vitality to resist fungoid disease. Table grapes can be and are more successfully cultivated, the amount of sugar in them is not of the same importance as in wine grapes, and being in smaller quantities greater attention to cultivation can be given. Plentiful manuring is indicated for this district, with careful pruning. Attention to these points would ensure a fair crop of sound table grapes, and the vines would be better enabled to resist fungoid disease.

STANTHORPE.—The soil of this district is composed of disintegrated granite, and is for the most part sandy and poor in quality, with a subsoil of clay apparently impervious to water. In places vines show signs of impaired vitality, are chlorosed, and a prey to fungoid disease, anthracnose being most prevalent. In two instances small vineyards of eight to ten years of age, which should have been in their prime, were utterly exhausted, and without a single grape on them. As at Mitchell, the vine will make a vigorous growth

for a few years and then collapse, and this may be explained in both cases as due to a light sandy soil, almost without humus, overlying a more or less impervious clay subsoil. Nitrogen is wanted. Plentiful manuring would be the remedy, but there enters the question of cost, &c. A certain amount of good could be done by sowing leguminous plants like the lupin, cowpea, vetches, &c., during the autumn and winter and then ploughing them in, the power of these species of plants to assimilate free nitrogen in their rootlets with the aid of certain bacteria being a well-known fact. In Southern Italy this way of enriching poor soils has been customary since the time of the Romans, although even now profoundly ignorant of the why or wherefore. That the custom is beneficial to poor soils is an established fact, and it might with considerable benefit be practised in the Stanthorpe district.

There is one vine, the Isabella, that has a remarkably vigorous growth amidst vines already exhausted, but the grape is of poor quality and unfit for wine-making. It has struck me that this power of flourishing and bearing in so poor and unsuitable a soil could be utilised by using them as stocks for grafting the better kinds, provided always that a scion of sufficient *affinity* be taken. Mr. Hoggan, of Ballandean, who was very kind in affording me every assistance and information in his power, has distributed a number of Shiraz cuttings far and wide, and it is possible more favourable spots for viticulture will be found than some of those I visited. But if this district is unsuited for the growth of wine grapes there can be no doubt about its adaptability for the cultivation of table grapes, some that I saw in one or two orchards being the finest I had seen in the colony. I would recommend viticulturists in this district to plant their vines in deep soils or *débris* of the range of hills, and pay careful attention to pruning and treatment for disease.

WARWICK.—In consequence of the very bad weather and condition of the roads I was only able to visit two vineyards, but it was sufficient to show me that a large part of this district is well adapted for viticulture and wine-making. Some of the wines I tasted were well prepared, with a good bouquet, and unfortified, showing that it is not necessary to fortify to preserve wine in this colony, as has been stated. In some red wines there was a scarcity of colour, which can easily be remedied by planting a few Tinto grapes with the others.

I was unable to make any tests for density, as the grapes were too unripe, but to judge from the wines I tasted it would be about that of the Burgundy district in France. The atmospheric temperature at the vintage time would be very favourable, which is of great importance in producing wine of finesse and bouquet. Climate and rainfall appear to be equally propitious for viticulture. I regret that the weather did not permit me to visit other parts of the Warwick district to verify to what distance the soil on which the vineyards I visited were planted extends. A second visit about vintage time would be useful in acquiring further knowledge of the possibilities of this promising district.

TOOWOOMBA.—The soil of this district is almost everywhere on the surface of great fertility, being a rich red volcanic soil; but in some places the subsoil is poor, passing into a kind of tufa. As the vine is a deep-feeder, vignerons should be careful before planting their vines to test the character and quality of the subsoil. In some instances this has not been done, with the result that at a comparatively early age the vines have begun to decline, yielding small crops of poor quality. Attention should likewise be given to planting the vines in as sheltered a position as possible, as much of the country is exposed to cold winds during the spring months. Where these dangers have been avoided the vines show a very luxuriant growth, and good sound wine has been made. In many vineyards a better system of pruning is indicated, far too many spurs being allowed, which weakens the vine, and causes premature decline. Also, more attention to precautions against disease, such as the use of sulphur for oidium, of iron wash for anthracnose.

CONCLUSIONS.

1. The districts of Mitchell and Stanthorpe are not, in my opinion, to be recommended for viticulture and wine-making. They will raise a good table grape if attention be paid to pruning and manuring.

2. The districts of Roma and Warwick are adapted for viticulture of all descriptions. The latter would appear to be very favourably situated for making wines of finesse and bouquet.

3. In the Roma district greater judgment is required in choosing a soil for viticulture than has hitherto been exercised in some cases. Good loamy soil is much preferable to the sandy ridges. Greater judgment is required in selecting vines for wine-making; a vineyard should be limited to half-a-dozen varieties at most.

4. In the Toowoomba district care must be taken in selection of soil and choice of sheltered positions. Here, as in other places, insufficient attention is given to pruning and combating disease.

5. The districts of Roma and Warwick—and perhaps those of Mitchell and Stanthorpe—appear to be well adapted for the cultivation of the Cognac grape for distillation. A large industry in this respect is growing up in Victoria and South Australia, and Queensland should not be backward in taking her place in the market.

6. To initiate this industry, cuttings of the Folle Blanche grape should be obtained and distributed in the above-mentioned districts for propagation, &c., under the supervision of competent individuals.

Reporting on his second visit to the Warwick district, Mr. Rainford says:—

The soil to a considerable distance round Warwick is of two descriptions.

1. Plains of deep, stiff black soil.

2. Ridges of reddish sandy loam and gravels, with a subsoil of yellow clay, more or less mixed with siliceous particles; the colour of this subsoil darkens on exposure to the atmosphere, either by oxidation or other chemical change, and may be met, where exposed by the creeks, of varying shades of light and dark-brown to black. It may be fairly assumed that the black stiff soils of the flats are the subsoils of strata that have been denuded, and of which the ridges are the existing remains.

The majority of these red soils are admirably adapted for vine cultivation, being deep, easily worked, more or less ferruginous in its nature, and well-drained; in some places nodules of ironstone are very plentiful, notably between Warwick and Yangan, where the soil assumes very much the nature and aspect of that of the Tintara vineyard of Mr. Thos. Hardy, of Adelaide, whose wine has a large sale in England, by Messrs. Burgoyne and Co., under its original name of Tintara; nor have I any doubt whatever that the Yangan soil would produce wine equally good. The acreage of the ridges must be very great, as much of the country for miles round Warwick consists of red soils, and the railway passes through similar ground for many miles on either side.

The density of the must produced on the ridges was tested by me, and found to range between 11.5 degrees and 13.5 degrees Baumé, corresponding to from 20 to 24 per cent. of sugar, which would produce theoretically from 21 to 26 per cent. of proof spirit. In practice, however, the alcoholic strength would be rather less, but, after making all reasonable allowance for loss during fermentation, &c., it will be seen that the density of the must is such as to produce wine having a natural alcoholic strength equal to wines of the Rhine, Burgundy, and Hungary. I may add that in some cases the grapes tested

were scarcely ripe, and might gain a little more density by hanging longer; and if selected varieties were planted, and the grapes allowed to hang until partly passolated, there is no reason why even the liqueur wines of the Rousillon and Graves type should not be made.

These being the possibilities of viticulture and wine-making in the Warwick district, it is a matter of regret that the industry is not in as flourishing a condition as could be wished. There are a considerable number of vines planted in various places, but the majority appear to be uncared for, and are in a very unsatisfactory condition. One of the reasons for this state of affairs is that vigneronns have not given that care and attention to cultivation and prevention against disease that the vine requires; in the majority of cases I noticed a very irrational method of pruning had been carried out, insufficient scarification to keep down weed-growth, and no application of sulphur or iron to keep the vines free from oidium and anthracnose.

Several vineyards of from three to six acres I came across were devastated with oidium and anthracnose owing entirely to improper cultivation. Nor were the owners taking any steps to prevent the damage beyond sitting on a fence and grumbling. This class of people appear to be under the impression that a vineyard is the same thing as a pear tree in the corner of the garden—when the fruit is ripe go and pick it. What is there beyond?

Another reason for the decline of some of the vineyards appears to be that since planting their vines vigneronns have gone in for other agricultural pursuits, such as stock-breeding, wheat, corn, &c., and sometimes other fruits. The inevitable result has followed in insufficient care in the cultivation of the vineyard. If the vigneron's time is divided amongst several kinds of cultivation, it is often the vineyard that suffers, as there appears to be a general opinion that anything done for the vine, at any time, will be all right. No greater mistake could be made; no plant responds more generously to good cultivation than the vine, and none sulks more if not properly looked after, and shows it by poor crops. With a declining return, the vigneron gives more and more attention to his other affairs, and so matters go from bad to worse. I venture to say that if the proprietors of some of the Warwick vineyards had continued to give the vines the same attention afterwards as they gave the first year or two, they would have been in a very different condition now, and this decline is to be attributed to their going in for too many things at once. A man who wants to raise stock, wheat, corn, and other similar matters, had better leave viticulture alone; he must fail in it, and his failure will deter others who would probably have done well.

The climate of the Warwick district appears to be favourable for viticulture, the rainfall is ample, and the excessive summer heats of districts further west appear to be wanting. The temperature during the vintage time is particularly favourable for a sound healthy fermentation which is requisite to produce wines of finesse and bouquet. The rainfall before and during the vintage is a drawback but one to which the whole colony is exposed; if it is not associated with a high temperature it should not prove more detrimental than a rainfall during vintage time in France and other wine producing countries.

CONCLUSIONS.

1. The Warwick district is equal to, if not better, than any other district in Queensland for viticulture and wine-making as regards both soil and climate; as a proof, the writer points to the satisfactory character of some of the Warwick wines.

2. That it is a mistake for vigneronns to make their own wine unless prepared to devote all their time and attention to it; this conclusion is equally applicable to other viticultural districts of Queensland.

3. That vineyards can be profitably cultivated as an adjunct to other agricultural pursuits, provided that the requisite care and attention be given to it, and the produce sold as fruit, or to other wine-makers.

Botany.

CONTRIBUTIONS TO THE QUEENSLAND FLORA.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

Order FUNGI.

STIGMATEA, Fries.

Perithecia slightly prominently innate, very thin, ostiola minute, nucleus firm white. Asci oblong subsessile, 8-spored, paraphyses or pseudoparaphyses. Sporidia elliptic-ovoid, uniseptate, transparent-yellow.—*From Syll. Fung.*

S. seminata (*B. and Rav.*). *Sacc. Syll. Fung. I.*, 543. Scattered, granular, the centre point at length perforated; asci clavate; sporidia 2-seriate, cymbiform, uniseptate, 25 μ long.—*Sacc. l.c.*

Hab.: On the pods of a prostrate *Desmodium* amongst the grass at Toowong. Also met with on the foliage of plants of the same genus in North America.—*Sacc. l.c.*

ROSELLINIA.

R. seriata, *Cke. and Mass.* Perithecia globose, glabrous, black, about 0.5 mm. diameter, growing in single or double rows, almost superficial. Asci cylindrical, 8-spored. Spores 1-seriate, continuous, brown, elliptical, 10-12 x 4-5 μ .

Hab.: On rotten wood, Gladfields, *C. J. Gwyther*. Notice in Bot. Bull. VIII., the description then not to hand. The above diagnosis kindly forwarded by Director of Royal Gardens, Kew, England.

GLÆOSPORIUM, Mont.

G. Kurzeanum, *Niessl.* *Sacc. in Syll. Fung. III.*, 705. Pustules loosely gregarious, innato-erumpent, of a dirty rosy-brown, small; conidia oblong-cylindrical 18 x 4, curved or nearly straight, binucleate, hyaline; basidia rod-like, almost equal in length to the conidium, hyaline, arising from a brown proliferous stratum.

Hab.: On the lower parts of the stems of a variety of *Lathyrus latifolius* (everlasting pea); growing in a garden in Brisbane. It is not unlikely but what this fungus may be found to attack some of the economic plants in cultivation belonging to *Lathyrus* and allied genera.

When first observed the following might be applied to the diseased plants:—Wash with water in which sulphate of iron has been dissolved—say about 2 lb. of the sulphate in 5 gallons of water.

Plate XXIX.



PILOCARPUS JABORANDI.

Economic Botany.

No. 6.

JABORANDI (*PILOCARPUS JABORANDI*, Holmes).

By J. F. BAILEY.

Derivation.—From *pilos*, a cap, and *karpus*, a fruit, referring to the shape of the berries.

Description.—A shrub, belonging to the order Rutaceæ. Height, 6 to 9 feet, slightly branched, branches erect, the bark somewhat smooth, grey with white dots; the young parts covered with a red down. Leaves alternate, leaflets in 3 to 4 pairs and a terminal one, oval oblong, of a leathery consistency, ultimately glabrous, midrib prominent on the under side. Flowers small, numerous, forming narrow racemes often a foot or more long, the pedicels thick, about $\frac{1}{2}$ -inch long, and spreading horizontally from all sides of a thick, cylindrical, somewhat furrowed rhachis. Fruit of 5 carpels, but one or more usually partially or completely abortive, the sides of which are marked with concentric ridges; seeds few, black and shining. Native of Brazil.

Cultivation.—Jaborandi may be propagated by cuttings, layers, or seeds. That the plant will thrive in this colony has been proved by the fact that one planted by Mr. Pink was growing in the Botanic Gardens, Brisbane, to within a few years ago, but like many other valuable plants succumbed during the 1893 flood. Before that time it was growing vigorously, and was standing 6 or 7 feet high, producing its long raceme of flowers, but no fruit.

Uses, &c.—Jaborandi has been chemically examined by various chemists, who have proved the presence of a volatile oil and a volatile alkaloid. The alkaloid thus obtained has been found to possess well-marked chemical and physiological properties, and although non-crystalline in itself, it is capable of forming with acids crystalline salts. It is soluble in water, alcohol, and chloroform. The active principle of Jaborandi is an alkaloid to which the name of *Pilocarpine* or *Pilocarpia* has been given. True Jaborandi is a powerful sudorific and sialogogue; after a time a large dose acts as an emetic, contracts the pupil of the eye, and causes the approximation of vision. It has been used in a great variety of diseases, most successfully in asthma, diabetes, and as an antidote to belladonna poisoning. It causes diarrhœa, and promotes secretion of milk. It is also employed as a hair wash. A simple method of obtaining this alkaloid, according to Hardy, is to make an infusion of the leaves, reduce it to a syrupy consistence, mix it with excess of magnesia, evaporate to dryness, treat the mixture with chloroform, evaporate the chloroform, and take up the residue with water. Upon placing the solution in a vacuum, the water is disengaged, and the base remains in a free state as a colourless viscous mass, soluble in water and alcohol. (B. and T. Med. Pls. and Mart. Pharm.)

According to recent London market reports the price of Jaborandi leaves was 2½d. per lb.

Popular Botany.

OUR BOTANIC GARDENS.

No. 5.

By PHILIP MAC MAHON,
Curator.

IN our last ramble we spoke, if you remember, of Palms, and we adjourned our chat as we stood amongst the groups of these beautiful plants, situate at the point marked L. 10 on your maps.

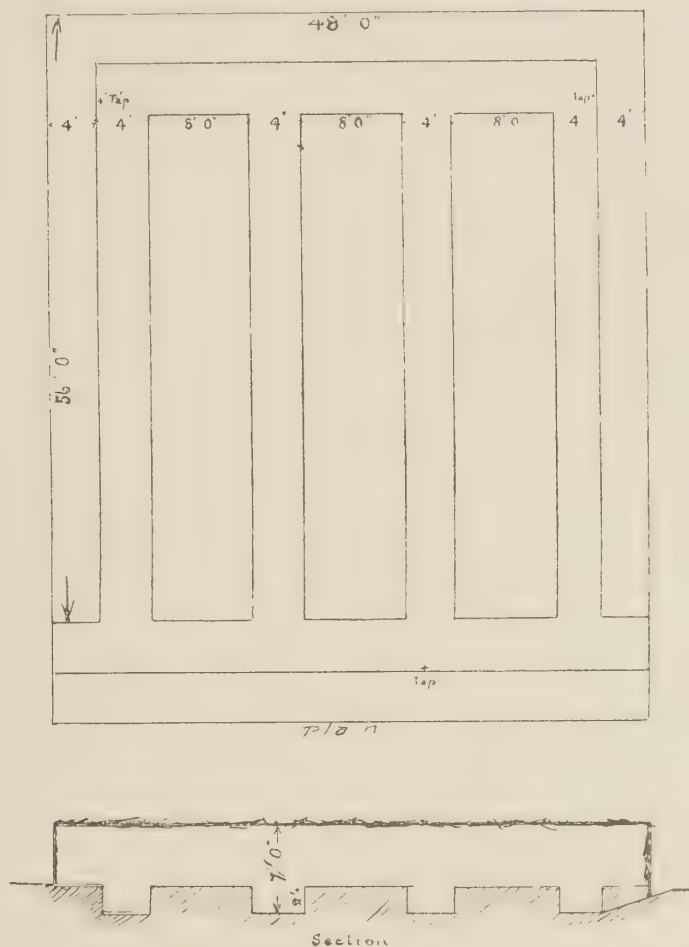
This is the time of year when the owner of a garden bethinks himself of getting seeds, or seedlings, and of making his or her garden gay with "English" flowers: the dainty Pansy, the bright Poppy—which takes back the mind of the wanderer to the cornfields of "Life's morning march, when his bosom was young"—the fragrant Mignonette, and the blue timid-looking Forget-me-not, and many strange exotic flowers which bloom so profusely in this land of sunshine.

Gardening in Queensland is a pleasure during the winter months. The tropical growth of weeds which serves to discourage the amateur during the summer has ceased, and given him a little breathing time.

The rich man employs his gardeners to minister to his delight by bringing together what is beautiful in the vegetable world so far as he is able, planting them in his gardens, and putting a ring fence around them. Our Botanic Gardens may be called the poor man's garden. Time was when the enjoyment of beauty was confined to the rich, but now it is in an almost unlimited degree the inheritance of every man and woman who knows how to appreciate the wondrous beauties of Nature and Art. Governments have found that men are better, nobler, purer, and braver for gardens and galleries, flowers, statuary, and pictures; and in the present year freeholds are being purchased in London, far more valuable for business purposes than any in Queen street, for the single purpose of being laid down in flower beds. Every day you meet the man who is so anxious to convince everyone that he is "practical"—that he cannot see a lovely tree or flower without asking, "What is it good for?" Well, like everything else which has proceeded from the Almighty Hand—like man himself—it is good to look at.

The people of Queensland pay each the sum of one penny annually to maintain their chief Botanic Gardens. The sum does not seem a very exorbitant one. They pay much more in every other country of which the statistics happen to be available. These Gardens have been instrumental in bringing beauty to the doors of many thousands residing in all parts of the country. There is a continual drain upon them to supply other gardens and public institutions in every town in Queensland with ornamental and useful plants; and we will chat to-day about one of the departments devoted to the propagation of plants both for our own use and for distribution—a work which is not seen by the public—and as we go we shall see what are the methods adopted, and perhaps learn something useful to us at this time of preparation and planting.

The illustration shows, to scale, a house which has been recently erected to meet the demand for a place in which to conveniently raise plants which are not very difficult of propagation in considerable quantities. It is situate in the private part of the grounds, and is not open to the general public. The site was an old sand-pit, and opportunity was taken of the fact to hollow out the walks as shown in the section. The beds are just high enough to work at comfortably, so that there is none of the stooping which goes so much against rapid work in pricking off seedlings, sowing, &c. The beds are kept in



position by posts of rough bush timber, let into the ground at the angles, and at suitable distances along the sides of the walks. A rail is halved into the tops of these posts; ties at intervals prevent the rails from spreading outward with the thrust of the earth, and rough split palings cut to the requisite length serve to prevent the earth from falling down. The posts which support the roof may be of any bush hardwood. They should be placed in the centres of the beds, a single line down each. Wires can be stretched on these, upon which to train delicate creepers, though as a general rule the fewer creepers you have about a propagating shade-house the better. The water is laid on in such a way that the pipes can be seen and got at. Here in Queensland we follow too much the English tradition of burying every water-pipe deep in the earth, although there is no frost to be avoided. They should be run along shade-house walls, or as in this case along the roof. A leak then becomes at once evident. It can be bound up until the arrival of the plumber, and can then be promptly repaired—that is, as promptly as a plumber's traditions will allow. You should never for any plants, if it can be avoided, draw the water into a water-pot from the tap. For one reason it is a terrible waste of time. These little leaks of time are not looked after nearly so closely as their importance deserves. The man who seems to be the busiest, and is often the most tired, is not by any means the one who accomplishes most work. Organisation of work is as essential here as in much greater affairs. While you are filling a water-pot slowly at the tap, your neighbour who has a receptacle, such as a half-barrel, can fill several pots and give his flowers a good watering. Again, water which is exposed to the air has certain injurious matters usually

contained in it cast to the bottom; the matter, too, which has been held not in chemical solution but in suspension, falls to the bottom instead of being spread over the leaves of your plants. You will see from this that it is a good plan to leave in the bottom of the receptacle a layer of some porous material which can be removed now and then, and in the spaces between which the sediment may settle and so escape being stirred up by the water-pot.

The covering of this house is just high enough to enable one to walk comfortably beneath it. The nearer it is to the seeds the better. It consists of ti-tree branches. They are threaded amongst strong wires, which are stretched across the roof about 18 inches apart and strained. By being on wires and so easily to be got at, it is quite easy for one in a few minutes to thread in a few more branches to increase the shade at a given spot, or to gradually withdraw the shade as the young plants become more able to bear the sun.

There is no mistake more fatal or more commonly made than that of imagining that because plants grow in shade under natural conditions that the shade cannot be too dense; as a matter of fact, if it is evenly distributed it can hardly be too light. It is not the light which some plants detest, but the direct rays of the sun. Most plants known as bush-house plants can be grown to a far greater degree of perfection in a place perfectly open to the light but exposed only to the morning sun than they are seen to attain in shaded structures. Even a very moderate degree of continued shade will kill that rampant plant, "nut grass." It cannot exist for any length of time in a shade-house, no matter what hold it previously had of the spot. It must be remembered that, even for plants which love shade, the shade in their natural haunts varies from month to month, as the vegetation above and around them varies, or the intensity of the sun's rays waxes and wanes.

Most seeds will not germinate under dense shade, and when they can be induced to do so the poor little spindle-shanked seedlings soon wither and die. When you see, as you often may, all the seedlings in a box or pot leaning in one direction and stretching out their tiny whitened stalks and leaves with just a suspicion of green in them, you know, if you understand the language of the plants, that they are echoing the cry of Goethe, "More light!" It is often said that plants will not grow under living shade. They will if it can be maintained at the correct density, but this is found in practice to be impossible or nearly so.

You see this bed packed with boxes of earth, in some of which small seedlings are appearing. Some are palms, and their curiously plaited leaves of a delicate tint of green appear above ground. They will remain in the boxes for some time. They act as if they were not quite sure of their reception in this cold world, and linger for some time before they venture beyond the seedling stage. Others are annuals. They are in a hurry. They have only a few months to grow, flower, perfect their seeds, and die. They are the butterflies of the plant world. They live their little day at fever heat. You must not leave them too long in the seed-boxes. Above all, you must not leave them too long under shade. Their forefathers came up with the first flush of spring, before the tender herbage had foliage enough to shade them, and if these, their descendants, are not treated to like conditions they take the only revenge in their power—they die. Let us begin at the beginning and trace the history of that box of seedlings. They are annuals, and the seed was gathered, most probably, in Germany or Belgium, where large areas are devoted to the purpose of seed-raising. The greatest care has been taken to obtain seeds only from the very healthiest and sturdiest plants. A continual process of selection is going on. Does a plant show any improved quality of flower or habit, the seeds are most carefully preserved and sown, and seeds again procured from these. By this system of selection many of the improved varieties with which our gardens teem have been obtained. But, not only is great care exercised in the selection and cultivation of the plants to bear the seed, it is recognised that shrivelled, light seeds cannot produce good plants, no matter from whence they are obtained; and

so the seeds themselves are carefully selected, all light, shrivelled seeds rejected, and every other precaution taken to ensure that each sample consists of fresh healthy seeds. All this means labour, and workmen have to be paid, and this is the reason that cheap seeds are bad seeds, and that it is better to have one packet of dear seeds of a given sort than two packets of cheap ones. All respectable dealers in garden seeds buy only of firms who guarantee that the above precautions have been taken. Home-saved seeds should be subjected to the same rigid system of selection. With two or three small sieves made from wire gauze, or other mesh, it is possible to grade seeds to a most wonderful degree of uniformity, if only sufficient trouble be taken. This is greatly neglected by agriculturists. Many seem to think that any kind of seed will do to reproduce the plant, and many men who would never dream of attempting to breed from sickly or weedy stock will cheerfully sow ungraded seed, of which one-half will produce only weaklings, and trust to Providence for the result. The result is that as they sow, so shall they reap, in its most literal sense. Take any sample of such seed, grade it into two portions, sow the small light seed, and plump heavy seed in separate rows side by side (not in separate plots), thus—

||	||	||	||	||	||	||	Light seed.
o	o	o	o	o	o	o	Heavy seed.
||	||	||	||	||	||	||	Light seed.
o	o	o	o	o	o	o	Heavy seed.
||	||	||	||	||	||	||	Light seed.
o	o	o	o	o	o	o	Heavy seed.

Treat all alike, and watch the plants develop. The result will astonish you.

In a place where the raising of seeds is an every-day business, preparation for next year's seed-sowing is taking place now. Leaves are being collected and turned and watered to form leaf mould, manure is being stacked to thoroughly decompose by the time it is required, and other preparations made.

But without all these materials at hand, how are you, you say, to make a start now. You are only in a small way of seed-raising, you say, and you want to know, in language you can understand, how to set to work. You have the seed, and you want—(1) the receptacle for the soil; (2) the soil; (3) the drainage. The basis of all garden soils is good loam. The top four inches of old pasture land will give you a good idea of what it is. If you have pot plants you should dig from such a pasture a top sod four inches deep. Lay in some out-of-the-way corner a layer of these sods; then a layer of manure, wood ashes, leaf soil, crushed bones and similar substances; then a layer of sods again, piling them up until you have a stack like a heap of sandwiches; protect with a few sheets of corrugated iron, and allow to stand for a few months. This broken down is the best potting and seed-sowing material you can obtain.

That heap which lies ready was made in this way: Three loads of loam were brought from a high bank by the river, care being taken to get it sufficiently deep in this instance to avoid the roots of weeds; to this was added one load sand, one load thoroughly rotted manure, one load thoroughly decomposed leaves, and one load fine charcoal. These were all dumped down on top of each other. Then a man with a shovel turned them all over one way and then back again, thoroughly mixing them. Then he took a portion and sifted it, the fine stuff being reserved for the covering for the seeds, the rough stuff being retained to put immediately over the drainage.

You can make up a mixture like this from many sources. Very good seed-sowing material may often be found where little floods of rain-water have deposited earth, vegetable refuse, and sand in culverts and by roadsides. When the stuff is ready it should be of such a consistence that when you take it in your hand and give it a good squeeze it will retain the shape given to it by your fingers, but will instantly fall to pieces again with a touch. It should be

capable of absorbing water, but should not, even when very wet, be capable of sticking together like clay or putty. You often see seeds sown in earth which you can mould with water into any shape. This will not do.

Then the receptacle. An ordinary fruit box with the side knocked out, and which can be got at any fruiterer's for 1d. or 2d., makes as good a receptacle as any, and needs no boring or drainage holes. On a large scale the boxes in which corrugated iron is imported are capital, and they may be raised on trestles or stakes, so as to do away with the tiresome necessity for constantly stooping. Close by the shade-house, of which an illustration is given, stands another, 24 yards long by 14 yards wide, and all around it is a stage of these cases, arranged like a long table. In these myriads of plants can be raised, and they are also useful for plants in the second stage, when they are "pricked off."

You put in the bottom of the box a layer of cinders, rough charcoal, or potshreds; then put in a layer of the rough stuff; then fill to within an inch and a-half of the top with the bulk of your material; then make all level with a light coating of the finer stuff, and sow your seed. You must do this evenly. You should practise sowing small seeds on a piece of white paper. You will soon learn the "knack." You can shade at first with unbleached calico, stretched on light lath frames, which you can easily tack together. Let your seedlings have light as soon as they appear. Do not delay too long about pricking them off. Let there be plenty of leaf soil in the bed into which you do this, and finally plant them into the places where they are to flower. Do not leave them long in the pricking-off bed. Remember that they have to bloom and perfect their seeds, and cannot afford to wait for you. You may broadly class the plants to be sown now with those which require the above treatment, and those which are better sown where they are to bloom.

One of the gardeners here (Mr. C. Mitchell), who has had charge of these plants, has made the following lists of those which are found to do well here:—

1. *Those requiring the treatment above described.*—Asters. *Asperula azurea* (Woodruff). *Arnubia cornuta*; the flowers last well. *Amaranthus* (Jacob's coat), very showy; do not plant in rich soil. *Antirrhinum* (Snapdragon), very showy and easily raised. *Aquilegia* (Columbine), an old country favourite. Balsam, usually planted during summer. *Chrysanthemum tricolor*; splendid for cutting for house decoration. *Clarkia elegans*, pretty dwarf annual. *Cosmia*, one of the best of all; makes beautiful masses, and is most beautiful in irregular groups. *Centaurea cyanus* (Cornflower), beautiful blue flowers, but often white and pink; lovely for bouquets. *Campanula media* (Canterbury bells). *Coreopsis*, one of the best of annuals. Candytuft makes beautiful masses; there are some very beautiful varieties of this old favourite. *Dianthus Heddewigii*; very fine flowers like cut velvet, likes a good soil and water, but repays you for all trouble. *Geum coccineum*. *Gomphrena* (Globe Amaranth), everlasting flowers. *Godetia*; several varieties, are most beautiful. *Gaillardia picta* should have a place in every garden; flowers bold and striking, beautiful for vases. *Helipterum corymbiflorum*, pretty everlasting. *Hibiscus africanus*, beautiful in masses. *Helichrysum bracteatum*; brilliant everlasting flowers, good for preserving for indoor decoration. *Ipomopsis elegans*. *Lupinus*; blue flowers, graceful plants; soak the seeds of these, and all very hard seeds, in hot water before you sow. *Lobelia*. *Mimulus* (Monkey-flower); water these freely. *Martynia fragrans*; the young seed-pods of these are good to pickle. Marigold; old and very general favourite. *Nemesia floribunda*; edging plant, very pretty. *Phlox Drummondii*; many varieties, most beautiful. Pansy (*Viola tricolor maxima*); to have this family really fine the ground must be deep and rich with old manure; the plants turn sickly and often die if new manure is used; they should be planted in rows 12 inches apart, and 9 inches apart in the rows; a cool, rather moist, partially shaded position is best for pansies; the first bloom should be picked off as soon as they appear, as, if they are allowed to flower too soon, they will soon wear themselves out.

Rhodanthe, an everlasting. *Sanvitalia procumbens*, dwarf. *Senecio elegans*; free flowering, and most useful for cutting. *Salpiglossis*; beautifully marked flowers, tall and graceful, very desirable. *Scabiosa*, sweet scented. *Centaurea moschata* (Sweet Sultan); water freely; stocks well-known favourites. *Silene armeria* (Catchfly); very showy and interesting. *Schizanthus*; most beautiful, flowers like an orchid. *Zinnia elegans*; colours varied and beautiful; now grown to great size and perfection of form.

2. *Plants the seeds of which should be sown where they are to bloom.*—*Collinsia bicolor*; an edging plant. *Cacalia* (tassel flower). *Clintonia elegans*; for edging. *Brachycome iberidifolia* (Swan River daisy); for edging and rockeries. *Browallia elata*. *Linum grandiflorum*; for sowing in patches. Mignonette should be sown in large patches. *Nycterina capensis*; very pretty for edges, &c. *Nemophila*; very showy, dwarf. Poppy; many varieties; thin out to 12 inches apart when seeds are well up. *Portulaca*; useful for dry sunny places. Virginian Stock; very useful for edgings and masses.

3. *Creepers which may be sown where they are intended to flower and thinned out.*—*Convolvulus major*, good for covering fences, &c. Sweet pea; snails are fond of these, and they should be protected by having ashes strewn around them; soak the seeds. *Eccremocarpus scaber*, very beautiful and quick climbing. *Mina lobata*. *Tropæolum*; there are many varieties of these plants, both climbing and prostrate, which deserve cultivation.

4. *Grasses which can be grown in boxes and planted out.*—*Avena sterilis* (animated oats); this and all these grasses are good for bouquets and decoration. *Andropogon Schimperii*. *Bromus macrostachys*. *Eragrostis elegans*. *Eulalia japonica*. *Hordeum jubatum* (squirrel tail). *Lagurus ovatus* (hare's tail). *Pennisetum longistylum*. *Stipa pennata*. *Tricholæna rosea*. *Uniola latifolia*; very graceful, and lasts a long time.

This list might be largely added to; but said the Editor, "A good many people want to know quite simple things, and they want to be told them in a simple way." So now proceed with your seed-sowing for the coming flower season, and as you revel in the delights of anticipation you can think of the fragrant garden that is to reward you for your pleasing labour, and say with Tennyson—

Soon will the Musk Carnations break and swell;
 Soon shall we have gold-dusted Snapdragon;
 Sweet William, with its homely cottage smell,
 Roses that down the valley shine afar,
 And open, jasmine-muffled lattices,
 And groups under the dreaming garden trees,
 And the full moon, and the white evening star.

Horticulture.

ROSE CULTURE.

At the monthly meeting of the Gympie Horticultural Society held on 8th March, Mr. W. G. Ambrose read the following paper on—

ROSE CULTURE.

As this paper is written by an amateur in horticulture, it will no doubt cause discussion among you, which is principally the object for which it is now placed before you, so that both myself and others may benefit by your criticism.

The progress of horticulture and floriculture in Queensland, and especially in our own district, since the formation of horticultural societies, is to be seen on every hand, and also through the assistance of the Department of Agriculture by sending to members free copies of the *Queensland Agricultural Journal* and introducing new and choice seeds and plants. But, they should go further and endow horticultural societies, no matter how small their membership, as by so doing it would place them in a position to show more frequently, and increase the capabilities of their members to encourage the various committees in their labours. My experience in this district is varied, owing to the changeable seasons, which are seldom to be relied on.

The only item to treat on in this paper is one which I have given the most attention to, and hence have the most knowledge of, and that is the "Queen of Flowers," the Rose. The greatest difficulty is to find the kind to grow. The best roses for garden decorations or for cut flowers seldom do for show purposes, but the best and most reliable kinds will take up only the same amount of room in your garden, and require only the same attention as common or inferior varieties.

The rose is about the most useful plant that can be found in any garden. The variety of colours, the quantity of blooms that the plants produce, and its delicious perfume, place it above all others.

That there is a growing demand for roses cannot be doubted, but the amateur should be very careful in the manner in which he attempts the planting of roses when he receives them from the nursery.

The rose requires a good heavy loamy soil—in fact, I have not yet had ground too heavy for them nor too much clay. Do not place them in clay only, but mix clay with good loamy soil and very old manure.

When planting see that the roots are well spread, and then cover the roots with soil and press as firmly as possible; the most failures with their cultivation arise from loose planting and using fresh stable manure, which is fatal to the rose. I have heard of some planting in a bed of new manure saying, "I'll make that fellow grow," but to their sorrow the reverse has always happened. Better, much better, plant your rose without manure than do this, also strongly avoid any manure that has sawdust mixed with it. I can speak with experience that sawdust makes the ground too loose and sour, and also encourages white ants around the roots. The rose will take any amount of manure, after the first year of planting, when thoroughly decomposed, or, better still, give it to them in a liquid state, with a good mulch around the plants to keep the ground moist, and then when watering the plants it will the sooner penetrate to its roots and gradually work the manure down. Artificial manures are in some cases good, but, if the supply is not continually given, the plants die back, and even at the best it seems to put false life into them. Bone dust is really good, as the plants are being continually fed as the bone decomposes, and ensure its freedom from seed of weeds and grass.

Pruning, when judiciously done, will assist almost as much as manuring. Always, when cutting blooms, cut with a long stem, say 3 or 4 inches, which will save you a lot of pruning later on, and also increase the flowering powers of your plant. Then about the month of July (for Gympie) commence the pruning of your plant by taking out all superfluous wood, thinning well out the centre of bush to admit light and air, and prevent crowding. Cut out all sickly timber; cut them to an eye or shoot that points outward, so that the new shoots will not cross each other. I would nip off any such shoots that tend to cross each other any time during the year, whether the plant is at rest or not. Another mistake we amateurs make is in allowing the blooms to form seed pods, which are in some cases all over the plant, and allowed to remain until ripened; then a great deal of the wood dies back to the detriment of the plant. This should not be, as all plants throw a considerable amount of strength in bringing seed to maturity.

The rose when received from the nursery may be on its own root or budded or grafted; if either of the latter, place the grafted or budded part 2 or 3 inches below the surface, and be very careful to watch for suckers, as these will grow far more vigorous than the original, and eventually you will lose the rose and have nothing but common stock or briar left, and then the blame will be thrown on the nurseryman, who is not in the least to blame in the matter. Some roses are preferable on grafted stocks; this I have proved by growing some of the best kinds from cuttings, and in some cases with very poor results; it is only by very careful watching and experimenting that you will be able to discover which is best. Again, try and remember every rose or plant by name that you have in your garden, which will help you to take a great pride in the science of horticulture, and prevent you from ordering plants that you may already have in your possession, or be like the squatter when he read about the benefits of the Eucalyptus. He immediately sent for a large supply at a great expense, and after they were growing some time discovered that they were gum-trees, of which he had hundreds of acres.

The roses that give the best satisfaction are Teas, and the foregoing is for their treatment. The H.P. roses do not give much satisfaction here, but they are undoubtedly of splendid shades, shape, and perfume, and cannot be beaten, when they strike a good season, for exhibition purposes. The pruning of H.P. roses differs very considerably from Teas, as the H.P.'s throw up long canes. Some nurserymen advise cutting off all canes, leaving about 2 inches above the ground, others again say 12 inches for strong growth and good bloom. I consider the former preferable, and remove a cane any time after the bloom has been removed, or even when you take off your bloom.

I now conclude with the following quotation from Longfellow:—

Spake full well in language quaint and olden,
One who dwelleth by the castled Rhine,
When he called the flowers, so blue and golden,
Stars that in earth's firmament do shine.

An interesting discussion ensued, in the course of which many useful hints regarding the cultivation of roses were gleaned.

PRESENTATION TO MR. AMBROSE.

Mr. F. I. Power (one of the vice-presidents of the society) then presented, on behalf of some of the members, a handsome gold pendant to Mr. W. G. Ambrose, the late secretary, as a slight token of esteem for his services and the regard entertained for him. Mr. Power, in making the presentation, referred in terms of praise to the manner in which Mr. Ambrose had performed his duties, and trusted he would long continue a member of the society, and further the useful work for which it had been promoted.

Mr. Ambrose briefly responded, thanking the members for their gift, which he would always treasure as a memento.

Tropical Industries.

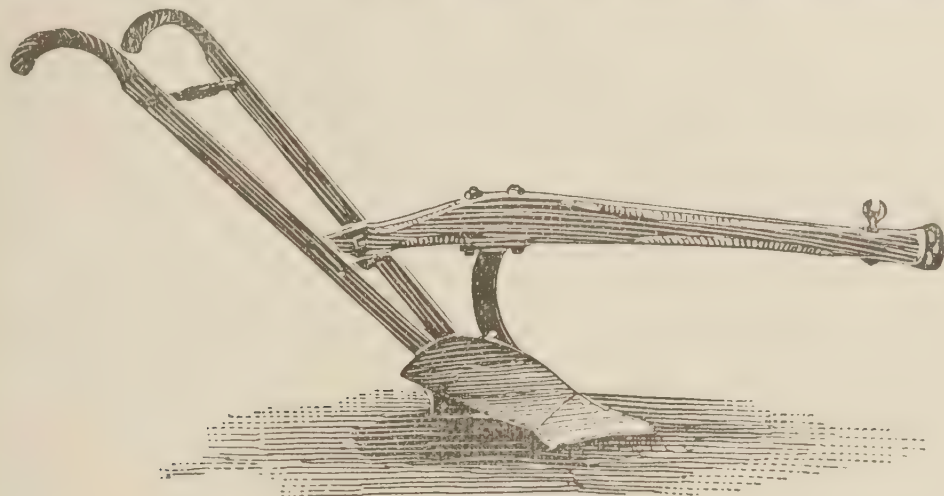
CULTIVATION OF TOBACCO.

By R. H. NEVILL,
Tobacco Expert.

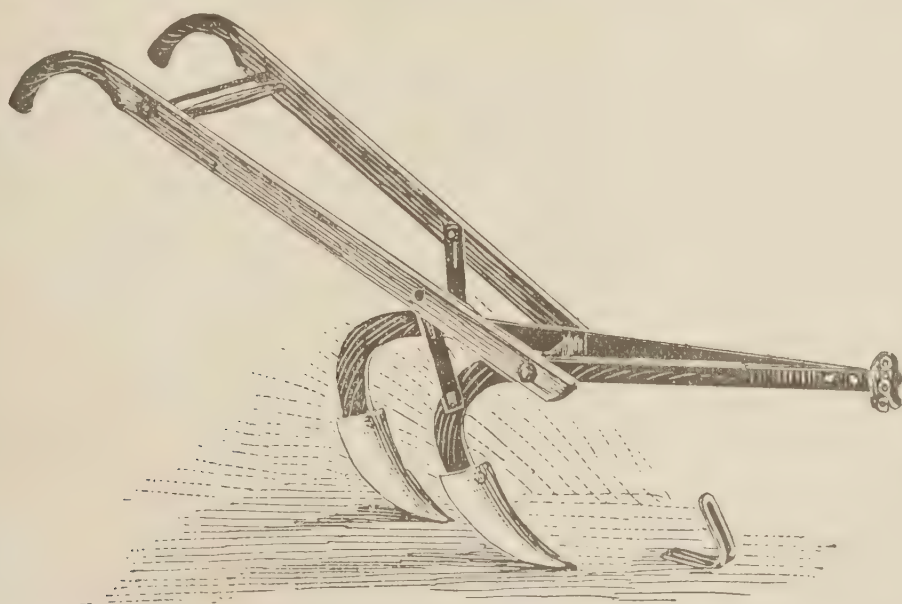
IN selecting land to be planted in tobacco, as nearly as possible it should be free from weeds and grass surrounding it, as such places serve as breeding-grounds and hiding-places for pests that may give great trouble to the farmer; it is best to have the tobacco field between other cultivated fields, such as corn and wheat, but not near potatoes. The ground should be well and deeply ploughed during the winter, in order to destroy the insect larvæ as much as possible, and to well rot the rubbish that may be turned under; and by means of a spring-tooth harrow or a cultivator it should be kept clean until the time for planting arrives. Before transplanting, the ground should again be deeply and well ploughed, not cutting too wide a furrow—by cutting only about two-thirds of the capacity of the plough, you pulverise better; the ploughing should be fully 8 or 10 inches deep; then double harrowed, to get the ground as finely pulverised as possible.

In other words, the ground should be in the best condition possible. New ground does not require so deep ploughing as old; it also gives a lighter yield and better colour. All the land intended for tobacco should be put in condition, that the farmer may be able to transplant whenever he has the opportunity. It should be checked off 3 feet 6 inches each way, so that it can be cultivated both ways, and kept clean. It is best to transplant in showery and cloudy weather if possible, as then the plants will not need to be watered or covered; if such weather cannot be had, then it is best to do it late in the afternoon, beginning when the sun is about an hour high, watering the plants as you set them, and covering early the next morning; this covering need not remain more than five or six days. It is best to set a piece of curled bark, or stick a shingle, in the ground in such a position as to shade the plant during the heat of the day. This enables the plant to get light and ventilation, whereas grass laid over it, and watering done over the grass, has a tendency to scald the young plant, and also shades and protects the insects in their work. If your plant bed is very dry and hard, water it sufficiently to make the earth soft before drawing the plants from the bed, and it is best to leave all the dirt possible sticking to the roots; the roots should not be pinched or in any way mutilated. The plants should not be washed before setting, for they are now free of disease or insects. In transplanting, use a peg, made from a piece of broom-handle, sharpened at one end; this should be thrust into the ground deep enough to take the whole root of the plant; insert the root, and press the dirt well around it; do not press it about the stem, but let the dirt be thrown loosely about it. The plant should be well and firmly set in the ground, and this can be determined by taking hold of the tip of the leaf and pulling gently, and if the plant is properly set the leaf will break without the plant pulling out. When properly set, they will take root in about ten days; and as soon as this has taken place and the plant begins growing, go over the field with a hoe, chopping the weeds from the field and loosening the earth about the plant, and after this a man with a hoe is not worth his tucker in the tobacco patch, but do the cultivating with the plough.

As soon as the plant begins growing thriftily, and while quite small, take on one horse turning plough, such as is here illustrated, which will cost 30s., and



run with the land side as close to the plant as possible without disturbing it, thus throwing the earth away from the plant, and then across the field the same way, leaving the plant standing on a small hill; let it remain this way for three or four days, if the weather be cloudy and rainy, but if it is hot and dry the earth should be thrown back into the furrow from which it was taken in thirty-six hours. This ploughing in old land should be deep, so as to give a deep and well pulverised soil for the roots to penetrate. After this the ground should never be allowed to pack and become hard, or get foul, but should be occasionally well and deeply stirred, first one way and then across with a double-shovel one-horse plough, cost 25s., care being taken not to disturb the roots or break



the leaves, ploughing a little further away from the plant each time. This ploughing tends to keep the earth moist, enables the roots to grow and spread, and you get a healthy, vigorous plant, the top leaves spreading and growing and ripening with the lower ones. If the weather is seasonable the last ploughing may be done with the turning plough throwing the dirt to the plant, thus forming a hill; but if the weather is dry the level cultivation is better.

Tobacco should be topped and primed as soon as the proper number of leaves can be secured; do not wait for the bloom. You retard the development of the top leaves in waiting too long, and the plant ripens at the bottom before the top is done growing.

Priming, that is bottom leaves taken off, leaves you less work to do and gives the remaining leaves the full benefit of plant life. All the leaves that are damaged should be taken off, and if none or only a few are damaged, take

four to six leaves, that the remaining ones may be well off the ground, then pinch out the top, leaving not more than fourteen leaves, though most good growers prefer twelve leaves. All the plants will not be ready for topping at once, and a second topping will be necessary, when every plant should be topped if it should have only six or eight leaves. Suckers must not be allowed to grow, but taken off as soon as they appear; for if allowed to grow they seriously damage the tobacco. The above is necessary in order to have the field ripen evenly, and this again is necessary to get a good cure.

In all the work done in getting out the crop and subsequent work, the idea should be to have a field of even growth, that all may be harvested at once. An important matter for the farmer to remember is not to overcrop himself, and to know that two acres of tobacco properly looked after will yield as many pounds and more shillings than four acres that have to be neglected; and that a plant topped at twelve or fourteen leaves will weigh as much as one of twenty leaves, and not so many leaves to sucker and to look after. More pounds and a better product, more shillings and less labour, will be the result if these instructions, taken with those given in the articles on plant-beds and curing, are faithfully followed.

Kainit is recommended to be sprinkled about the foot of the plant to keep off the cutworm.

RAMIE FIBRE (RHEA).

THE Department of Agriculture has received from the Rhea Fibre Company, Limited, London, a very beautifully got-up sample case of articles manufactured from the fibre of the Rhea (China-grass), of which so much has been lately written in the Agricultural Press all over the tropical world.

The samples forwarded show to what various uses the fibre of this plant can be put. The materials are most beautiful, both in appearance and workmanship, and range from coarse canvas to the finest silk-like productions. First, we see the rough Rhea "cane" as it appears cut from the plant and dried; then the bark as it leaves the decorticating machine. In an adjoining compartment is seen the cleaned fibre, called "filasse," looking like floss silk or white silk from the cocoon of the silkworm. Next we have hanks of variously coloured thread, which leads to the fabrics made of it—such as Rhea plush, 30 inches wide, soft and thick; Rhea velvet prints, 29 inches wide. There is also some very fine lacework of the same fibre, which is well set off by lying on a couch of rich red plush. The adaptation of the fibre to various uses is well exemplified in a pair of soft, elastic ladies' stockings. The case also contains cretonnes, curtains, tapestry, &c.; but the most beautiful of all is the embossed Rhea plush, whose beauty is well set off by a square of Rhea sailcloth. Canvas cloth, damask tablecloth, striped cotton flannelettes, silk dresses (red, pink, and figured), complete the list, and show conclusively that Rhea can be made to take the place of silk, cotton, jute, hemp, and similar fibres. There is doubtless a great future before this industry. If cheap and effective machinery can be employed to clean the bark, there is no reason why Queensland should not take a large share in the production of this easily grown plant. The Department of Agriculture have a small area growing at the Cairns State Nursery, and a limited number of plants will be available for distribution. In Vol. I., Part 5 (p. 391), of this *Journal*, will be found full particulars respecting the cultivation, manufacture, uses, and market value of the fibre.

THE DIVI-DIVI.

THE following additional reports on the sample of Divi-divi sent to England by the Department of Agriculture, last year, have been received through the Acting Agent-General in London:—

Messrs. Anning and Cobb:—"We have received the sample of Divi-divi, which we report on as follows: Rather dark in colour, sound, and well grown. Value, from £9 to £10 per ton. This is as near as we can get to its value without testing."

Messrs. Samuel Barrow and Brother, Limited:—"Referring to your inquiry of the 29th January, the value in London of the Divi-divi is about £7 per ton, but it is very little used for tanning purposes, however, on account of its liability to ferment. Atmospheric influences do not agree with it."

In our remarks on the Divi-divi tree last month, we stated that "a net profit of 18s. per *ton* has been derived from 25-year-old trees." (Vol. II., Part 4, p. 305.) This is an obvious misprint. It should have read "18s. per *tree*."

THE WORLD'S CANE SUGAR INDUSTRY.

COMMUNICATED BY J. C. BRÜNNICH,
Agricultural Chemist, Queensland Agricultural College.

THE director of the Sugar Experiment Station in West Java, Mr. H. C. Prinsen Geerligs, has just published a very interesting account of the sugar-cane industry in the various countries of the world.* This account is of the greatest interest to our colony in particular, although we produce only about '02 per cent. of the total cane sugar produced in the world. At the end of the pamphlet Mr. Prinsen Geerligs gives tables showing the production of sugar in the various countries, and also the cost of this production; and for the benefit of our readers I give these tables, and also translate some of these figures into values more familiar to us.

From these figures we can see that in point of manufacture very little is to be learned in our colony, and that we occupy the fourth place with regard to the cost of sugar turned out in spite of our smaller mills. Still our yield of sugar per acre of cane cultivated (1.6 tons) is very small in comparison with the yield of some of the other countries.

Although we can never hope to reach the phenomenal maximum yields of Java and the Sandwich Islands with 6 and 8 tons of sugar per acre respectively, still we should try to improve the yield of our own canes. Both in Java and in the Sandwich Islands, celebrated Sugar Experiment Stations exist, and I have no doubt that their great success is due to better cultivation and to the results of the researches and experiments carried out at these stations.

As long as experimenting is confined in this colony to a few individuals showing a keener interest in the industry than the rest, but still working without organisation, we cannot hope for great results. Only the establishing of Sugar Experiment Stations in the principal sugar districts will be of value, and then the co-operation of the few workers and the use of their results will become doubly useful and beneficial to this important industry of our colony, and the men who need help most, the cane-farmers, will be the chief gainers.

* De toestand der rietsuiker industrie in de verschillende productielanden, door H. C. Prinsen Geerligs.

FIRST TABLE.

Country.	—	Pikols Cane per Bouw.	Pikols Sugar per Bouw.	Rende- ment,	Average Yearly Pro- duct in Pikols per Factory.	Tons Cane per Acre.	Tons Sugar per Acre.	Tons Cane per Ton Sugar.
Java	Maximum	2,300	154	13·99	103,500 (6,400 tons)	92	6·2	7·1
Ditto	Average	900	90	10	48,000 (3,000 tons)	36	3·6	10·0
Sandwich Islands	Maximum	...	200	12·9	...	...	8·0	7·8
Ditto	Average	834	83·4	10	70,000 (4,300 tons)	33·4	3·3	10·0
Peru	...	...	81	...	...	...	3·2	...
Egypt	Maximum	...	...	...	258,000	...	...	...
Ditto	Average	550	55	10	67,000	22·0	2·2	10·0
Reunion	...	600	54	9	...	24	2·2	11·1
Philippine Islands	...	...	46	...	1,600	...	1·8	...
Straits Settlements	...	600	45	7·5	...	24	1·8	13·3
New South Wales	...	400	42·8	10·7	14,400	16	1·7	9·3
Queensland ...	Maximum	...	...	12·8	...	...	...	7·8
Ditto	Average	400	40	10·0	25,000 (1,550 tons)	16	1·6	10·0
Louisiana	...	513	38·5	7·5	20,000	20·5	1·5	13·3
British India ...	...	...	36·2	...	...	...	1·4	...
Spain	...	500	35	7	...	20·0	1·4	14·3
Japan	...	380	26·6	7	...	15·2	1·1	14·3

SECOND TABLE.

Cost of Production in Country with Gold Standard Guildens per Pikol.	Sandwich Islands.	Java.	Queensland.	Egypt.	Barbados.	Trinidad.	Demerara.	French Antilles.	United States.
Cost of cane	...	3·65	4·39	4·83	...	...	...	...	10·75
„ manufacture	...	1·90	1·	1·24	...	...	...	...	} 2·82
„ various	...	·75	1·	·90	...	...	...	...	
Total cost guildens per pikol	6·00	6·30	6·39	6·97	7·12	8·03	9·45	10·47	13·82
Cost of sugar per ton	£ s. d. 8 4 4	£ s. d. 8 12 6	£ s. d. 8 15	£ s. d. 9 10 11	£ s. d. 9 15	£ s. d. 10 19 11	£ s. d. 12 18 10	£ s. d. 14 6 9	£ s. d. 18 18 6

Cost of Production in Country with Silver Standard.	Philippine Islands.	Mauritius.	Argentine Republic.	Japan.	Brazil.
Cost of cane	...	5·90	8·68	...	...
„ manufacture	...	} ·76	4·34	...	...
„ various	...		...	...	...
Total cost guildens per pikol	5·00	6·66	12·96	9·70—12·30	16·32
Cost per ton	£ s. d. 6 16 11	£ s. d. 9 2 5	£ s. d. 17 14 11	£ s. d. { 13 5 8 to 16 16 10 }	£ s. d. 22 6 11

Chemistry.

POTASH AND ITS FUNCTIONS IN AGRICULTURE.

THE following is a brief summary of an exhaustive paper on the above subject by the Chief of the Division of Chemistry in the United States Department of Agriculture:—

1. The potash used in fertilisers and found in the soil has been derived from the decay of minerals containing it as an ingredient, and chiefly from feldspars.

2. During the progress of weathering, a portion of the potash in original rocks becomes soluble and is lost by lixiviation. As a rule, about 25 per cent. of the potash finds its way by this means into the streams and seas.

3. There is usually a less percentage of potash in the finer particles of soil than in the coarser particles, and this is due to the fact that the solvent action of water is more strongly exerted upon the finer particles.

4. The potash is quite evenly distributed both in the soil and subsoil, there being only a slightly greater proportion in the deeper layers, doubtless owing to the fact that they have not been so thoroughly leached.

5. The solubility of potash in the soil is very different for different solvents, the least for the weak organic acids and greatest for the strong mineral acids. Hot hydrochloric acid extracts from the soil about 20 per cent. of its total potash content, which is about thirty-two times as much as is removed by a 1 per cent. citric acid solution.

6. A fertile virgin soil contains about 2 per cent. of total potash, or about 70,000 lb. per acre taken to the depth of 1 foot. A crop removing 50 lb. of potash a year could be grown consecutively for about 1,400 years on such a soil before exhausting all the potash which it contains.

7. The soil retains a certain quantity of fertilising material with such tenacity as to render it practically impossible for plants to withdraw the whole of it, thus protecting the future against the rapacity of the present.

8. The quantity of potash removed by various crops per annum varies greatly. The largest quantities are removed by beets, and the smallest quantities by cereals and cotton. Beets may remove as much as 100 lb. per acre, cereals about 30 lb., and cotton about 23 lb. for the average crops as produced in this country. In Germany, beets grown for forage remove often over 200 lb. of potash per acre from the soil, clover hay about 74 lb., and tobacco the same quantity.

9. Tobacco contains a larger proportion of potash than any other common crop—viz., about 40 parts per 1,000 of the dry leaves. Forage beets contain 35, potatoes 20, sugar beets 18, clover hay 19, beans 13, and cereals 5 parts per 1,000.

10. There is about four times as much potash in the straw of cereals as in the grains, while in peas and beans the proportion is about as two to one.

11. A soil which yields about 0.01 per cent. of potash to a 1 per cent. citric acid solution, and contains about 0.30 per cent. soluble in hydrochloric acid does not usually need a potash fertiliser.

12. The potash salts which supply the commercial potash fertilisers of the world have been deposited as the result of the evaporation of saline lakes charged with potassic materials.

13. The commercial potash of the world is derived almost exclusively from the neighbourhood of Stassfurt, in Germany. The quantity of crude salts annually mined is about 750,000 tons, worth nearly 3,000,000 dollars.

14. The high-grade commercial salts used for fertilising purposes are manufactured from the crude salts, and are to be preferred when shipments are made to great distances and at high rates of freight.

15. The principal crude potash salts used for fertilising purposes are kainite containing 12·5 per cent. of potash, and carnallite containing 9·9 per cent.

16. Tobacco waste, cotton-seed hulls, and wood ashes also furnish important quantities of potash for fertilising purposes.

17. Recovered marsh or swamp lands and lands containing large quantities of sand, need, almost universally, potash fertiliser. The percentage of potash in soils usually rises with their content of clay.

18. The maximum effect from fertilisation with potash is secured only when other plant foods are supplied in such a way as to make a well-balanced ration, and where proper methods of culture are employed.

19. Lime is an important adjunct to potash fertilisation, and, as a rule, should be added to a soil in large quantities wherever potash is applied.

20. The best kind of potash fertiliser is determined by local conditions, freights, and the nature of the soil and the crop. Fertilisers containing considerable quantities of chloride should never be applied to vineyards and tobacco fields.

21. In intensive pot or garden cultivation, where highly-concentrated plant foods are required, and where the cost of the fertiliser is unduly great, potash may be applied in the form of potash salts or nitrate.

22. In some soils potash salts, in common with other saline bodies, produce injurious effects by reason of their hygroscopic nature, attracting moisture, and, on drying, producing a cementation of the soil, which renders it impervious to water and impenetrable by the rootlets of plants.

23. Crude potash salts can be applied with benefit in the preservation of stall manure, but their value for this purpose is perhaps over-estimated.

24. Potash fertilisers should, as a rule, be applied in the autumn, or at least from two to four weeks before planting, and should be thoroughly worked into the deeper part of the soil in order to come into contact with the rootlets of the plant.

25. The germination of seeds, especially if they have a low vitality, is retarded by bringing them into direct contact with potash salts.

26. The application of crude potash salts to a soil which is not easily cemented may be useful during a dry season by reason of their power of attracting and holding moisture.

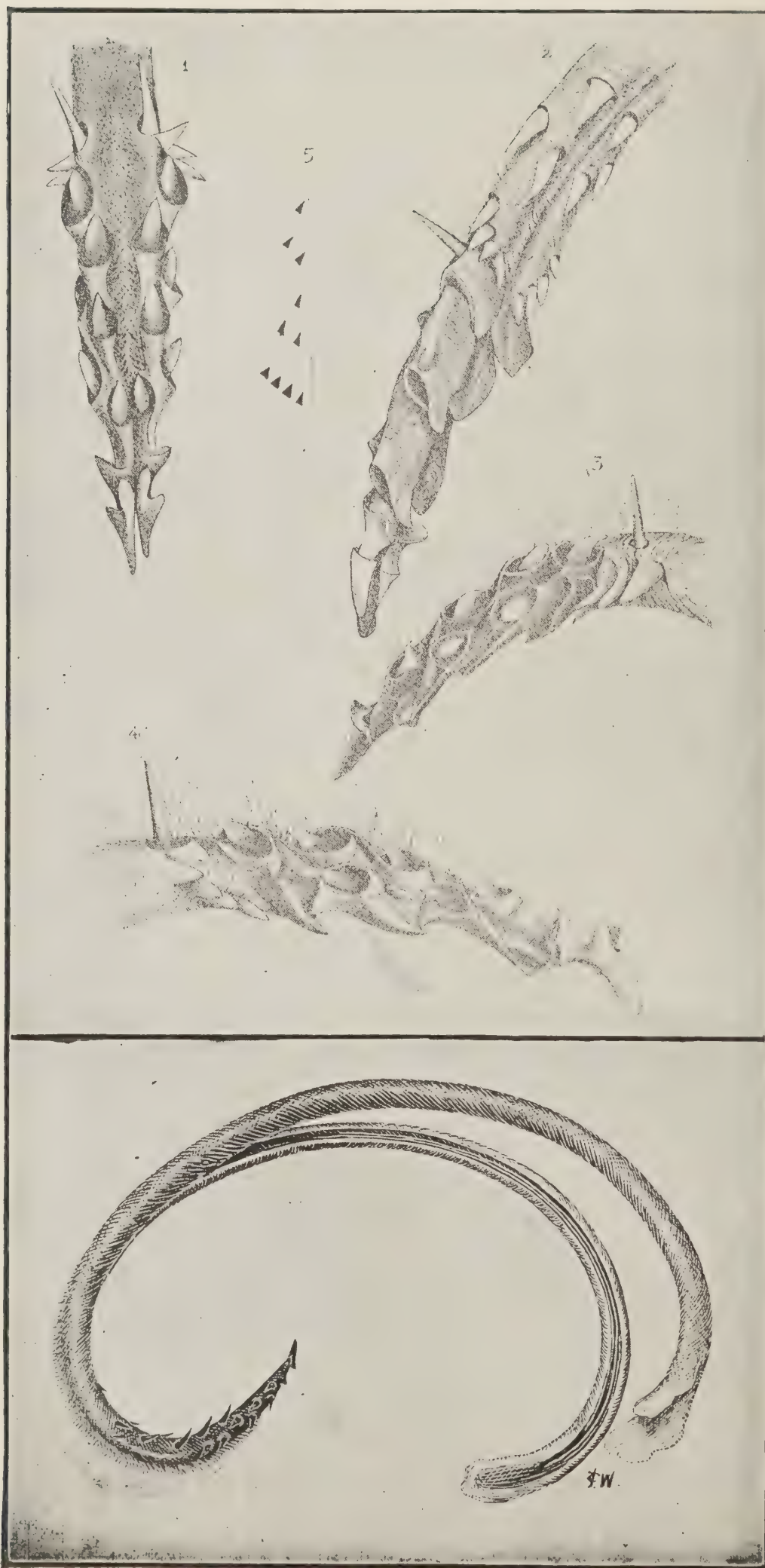
27. Potash salts favour the decomposition of mineral particles in the soil, and thus tend to add to the stores of plant food therein.

28. The application of crude potash salts to the soil tends to protect the crops from frosts by preventing the too rapid evaporation of moisture, and by producing a more luxuriant foliage.

29. The too abundant application of potash to the soil may become injurious by reason of the retardation of the process of nitrification which it produces.

30. Crude potash salts, especially kainit, when added abundantly to a soil, are said to act, to a certain extent, as an insecticide or a preventive of disease, and when mixed with stable manure act as a preservative by checking the activity of the denitrifying ferments.

31. It is impracticable to give formulas for the preparation of fertilisers containing potash, since both the quantity of potash to be used and the form in which it should be applied are determined by local conditions, which cannot be taken into account in the preparation of directions for the use of fertilisers.



PROBOSCIS OF ORANGE-PIERCING MOTHS.

FAMILY OPHIDERINÆ.

Entomology.

ORANGE-PIERCING MOTHS—FAM. OPHIDERINÆ.

By HENRY TRYON,
Entomologist.

DESCRIPTION OF PLATE XXIIA.*

FIGS. 1-4.—Terminal 8th. (1, upper surface of borer; 2, under surface of borer; 3 and 4, side views of same.)

FIG. 5.—Arrangement of spines. (After R. B. Read, Proc.⁷¹ Lin. Soc. N.S.W. III. Pl. XIV.)

FIG. w.—Entire proboscis. (From drawing by F. C. Wills.)

Figs. 1, 3, and 4 magnified 65 diameters.

Fig. 5 „ 46 „

Fig. w „ 16 „

* For a full description of the perforating and suctorial organ illustrated on this plate, the reader is referred to pp. 312-313 of the *Journal*.—Ed. *Q.A.J.*

8 Tick Fever.✓

PREVENTIVE INOCULATION OF BULLS FOR TICK FEVER.

REPORT BY J. C. POUND,

Director of Stock Institute.

EXPERIMENT AT RATHDOWNEY.

IN accordance with a recommendation of Mr. W. Collins, I visited Rathdowney, in the Logan district, on the 20th August, 1897, and inoculated 35 bulls with blood from No. 18 steer, which was inoculated five months previously at Mundoolun from one of the original Inkerman steers. The bulls were turned into a good paddock in which there was a plentiful supply of grass, fresh water, and shady trees, and were never allowed to be disturbed in any way whatever. No deaths resulted, and the stockman in charge reported that none of the animals showed any apparent outward signs of sickness. Towards the end of October, two months afterwards, all of these bulls were inoculated a second time with 5 c.c. of defibrinated blood taken from the Inkerman steer, and, as on the previous occasion, the animals were well cared for; consequently none died, and none were reported as being sick.

Instead of sending these bulls away into a grossly tick-infested district to test the efficacy of the inoculation, it was decided that they should all remain at Rathdowney for several months, and then be injected with a fairly large quantity of virulent blood from a case (produced artificially) of tick fever. To make the test still more conclusive, I recommended to Mr. Collins that 10 healthy steers, as controls, should be inoculated at the same time with the same virulent blood, which was accordingly agreed to. In order to obtain virulent blood for this test experiment, the following programme was carried out:—On the 3rd February, Mr. Geo. Collins inoculated 5 healthy steers, each receiving 8 c.c. of blood taken from the Inkerman steer, and from the 14th to the 21st February all had their temperatures taken regularly night and morning. The maximum temperatures of these 5 animals after inoculation were as follow:—

No.		Maximum Temperature.		Days after Inoculation.
1	...	104·7	...	12
*2	...	106·3	...	17
3	...	105·8	...	17
4	...	104·6	...	11
5	...	104·5	...	11

No. 2 animal, with a temperature of 106·3 F., although not exhibiting very prominent outward signs of sickness, was the one selected to draw blood from with which to inoculate the bulls and control steers, and which operation

I entrusted to my assistant, Mr. H. Beardmore. On the 21st February each of the bulls and 10 healthy young steers received an injection under the skin behind the shoulder of 8 c.c. of blood from the No. 2 steer, which was at the time suffering from acute tick fever. After inoculation they were all placed in a good grass paddock, and well supplied with fresh water.

Although I had never before attempted to take the temperatures of mature bulls after inoculation, it was considered advisable on the present occasion that some close observations should be recorded; consequently I instructed my assistant, Mr. H. Beck, to commence taking the temperatures of 10 of the bulls and the 10 control steers as soon after inoculation as possible. Owing to the prevailing heavy wet weather at the time, Mr. Beck was unable to reach Rathdowney before the 23rd (two days after the animals were inoculated); but no time was lost—the animals were mustered, and their temperatures taken that morning. Just after having taken the temperature of the first bull in the afternoon of the same day, an unfortunate accident occurred whereby both of the thermometers got broken, which meant several days' delay in the observations; however, by the 27th February (six days after inoculation) Mr. Beck was supplied with a fresh consignment of thermometers, and the work of taking the animals' temperatures was proceeded with, and carried on without interruption until the 8th March, or fifteen days after inoculation, when all the temperatures had fallen to about normal.

Now, as to the result of this experiment, not one of the bulls exhibited even the slightest signs of sickness, neither was there any indication of fever in the 10 bulls that had their temperatures taken; beyond the usual elevation in temperature for a few hours in one or two individual animals, caused solely by excitement, the temperatures remained at normal throughout. But we have a totally different condition of affairs with regard to the 10 control steers, 7 of which were suffering from fever on the sixth day, and by the tenth day after inoculation every animal was suffering from a severe attack of acute fever—some with most pronounced symptoms of hemaglobinuria (redwater)—and the temperature in several instances reaching to nearly 103 degrees Fahr. From this date the fever gradually subsided, and by the 8th March all the temperatures were down to normal.

The success of these experiments is, in my opinion, principally due to the following important factors, viz.:—

1. All the bulls and steers were young, being under three years old; in fact, most of them were under two years old—*i.e.*, they were not of a very susceptible age.

2. Although the bulls were bred in New South Wales, they were allowed to settle down and get thoroughly accustomed to their new home at Rathdowney before inoculation.

3. Special care was exercised during the inoculation, the animals being handled carefully, and each received exactly the same amount of blood.

4. There were no possible chances of the blood becoming contaminated before injection.

5. After inoculation the animals were well cared for, being placed in good paddocks with plenty of fresh grass, water, and shady trees.

6. The 20 animals—bulls and steers—whose temperatures were taken regularly night and morning, were in charge of a thoroughly trained and reliable assistant, whose duty towards sick experimental animals is that of a hospital nurse towards her patients.

CONCLUSIONS

Although not yet complete, the result, up to date, of this experiment is exceedingly interesting, and corresponding with the undoubted success of the first important protective inoculation experiment at Mundoolun just twelve months ago. I fully anticipate that when the bulls are subjected to gross tick infection at Inkerman they will remain absolutely immune to natural tick fever. If this be realised, then I consider that there can be no possible excuse or reason given for delays in the introduction of new blood from Southern Queensland, New South Wales or Victoria, for the much-needed improvement of the general herds of Northern Queensland.

The fact that all the animals in this experiment were young confirms in a very crucial manner the observations I made on the Gilbert, Norman, and Flinders Rivers in 1894 and 1895 regarding the general resistance or insusceptibility of young animals to a fatal attack of tick fever.

TEMPERATURES OF 5 STEERS INOCULATED ON 3RD FEBRUARY, 1898, WITH 8 C.C. BLOOD FROM INKERMEN STEER.

Date.					No. 1.		No. 2.*		No. 3.		No. 4.		No. 5.	
					M.	E.	M.	E.	M.	E.	M.	E.	M.	E.
1898.														
14	February	...	...	...	102·6	104·2	102·2	103·6	102·8	104·4	103·5	104·6	103·5	104·5
15	"	...	.	...	101·2	104·7	101·6	104·2	101·4	105·4	101·8	104·3	102·2	103·7
16	"	...	...	...	103·8	104·4	102·6	101·8	102·6	104·2	103·3	103·4	102·6	103·4
17	"	...	...	...	103·2	102·6	103·8	104·6	102·6	102·4	102·3	102·4	102·6	102·6
18	"	...	...	...	102·8	102·4	104·2	105·2	103·8	104·7	103·0	102·3	104·2	104·0
19	"	...	...	...	102·0	102·7	105·5	105·4	105·4	104·3	102·4	102·4	104·4	102·8
20	"	...	...	...	101·2	102·6	105·4	*106·3	103·8	105·8	101·6	103·8	101·2	103·0
21	"	...	...	...	102·2	...	104·6	...	101·8	...	102·9	...	101·4	...

TEMPERATURES OF 10 STEERS INOCULATED AT RATHDOWNNEY ON 21ST FEBRUARY, 1898, WITH 8 C.C. VIRULENT BLOOD FROM STEER No. 2.

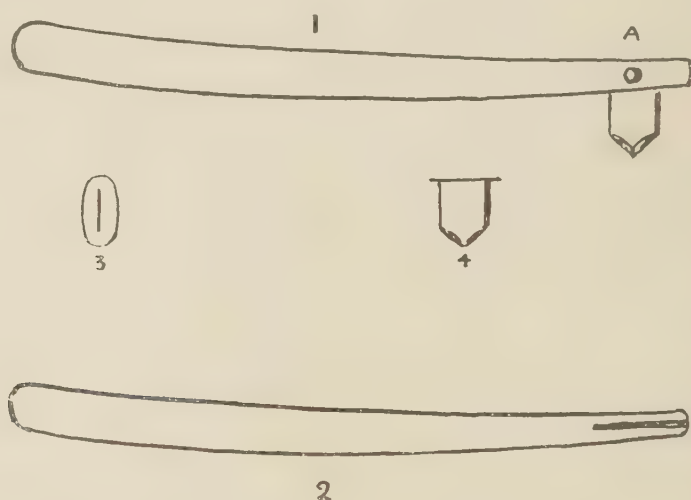
Date.	No. 1.		No. 2.		No. 3.		No. 4.		No. 5.		No. 6.		No. 7.		No. 8.		No. 9.		No. 10.	
	M.	E.	M.	E.	M.	E.	M.	E.	M.	E.	M.	E.	M.	E.	M.	E.	M.	E.	M.	E.
1898.																				
23 February	101.2	...	102.0	...	102.2	...	102.3	...	101.0	...	102.0	...	101.8	...	102.2	...	102.5	...	102.6	...
27 "	103.0	105.0	105.8	106.1	105.6	105.3	102.4	103.8	104.4	105.3	105.1	105.5	103.8	105.0	102.6	103.5	102.5	104.6	103.6	106.2
28 "	103.8	105.8	106.1	105.6	104.8	103.6	103.7	104.5	103.6	104.4	105.6	106.2	103.8	105.8	103.6	104.6	104.2	105.8	105.2	105.8
1 March	104.8	106.8	105.2	105.8	103.0	105.3	104.4	105.4	102.6	104.6	104.2	104.6	102.6	105.2	102.5	104.0	103.8	104.2	105.6	106.6
2 "	105.7	106.7	106.3	105.8	105.3	105.6	105.7	105.8	104.3	105.4	104.4	105.3	103.4	104.8	102.2	103.6	104.6	103.0	106.6	103.8
3 "	107.2	106.4	106.9	106.6	104.4	104.2	106.3	107.0	105.0	105.5	105.7	105.7	101.8	103.8	102.5	104.0	105.6	103.4	107.7	105.6
4 "	105.6	105.4	104.0	105.3	105.0	105.2	106.8	105.4	105.6	106.1	104.4	104.2	105.5	105.0	103.6	103.4	105.2	105.1	106.4	106.2
5 "	103.3	103.2	102.8	102.2	103.8	104.0	103.8	103.7	103.6	103.7	102.2	102.6	104.4	104.3	102.4	103.3	103.8	104.2	103.8	104.0
6 "	101.6	101.9	102.6	103.3	102.4	103.2	102.2	101.8	102.6	102.2	101.2	101.7	102.4	102.8	101.8	102.3	101.8	101.8	102.4	102.5
7 "	100.2	100.1	101.6	102.4	100.8	102.2	101.0	102.4	100.8	102.2	100.5	101.8	100.4	102.2	101.2	101.2	100.6	101.4	109.6	101.8
8 "	100.6	...	101.8	...	101.6	...	101.4	...	101.2	...	101.8	...	101.0	...	101.8	...	101.8	...	101.2	...

TEMPERATURES OF 10 BULLS INOCULATED AT RATHDOWNNEY ON 21ST FEBRUARY, 1898, WITH 8 C.C. VIRULENT BLOOD FROM STEER No. 2.

Date.	No. 1.		No. 2.		No. 3.		No. 4.		No. 5.		No. 6.		No. 7.		No. 8.		No. 9.		No. 10.	
	M.	E.	M.	E.	M.	E.	M.	E.	M.	E.	M.	E.	M.	E.	M.	E.	M.	E.	M.	E.
1898.																				
23 February	102.6	...	102.8	...	102.0	...	102.2	101.8	101.8	102.8	101.6	102.5	...	...	101.6	103.0	102.6	...	...	...
27 "	101.8	102.6	104.6	105.0	101.6	102.4	101.2	102.8	101.8	103.0	101.6	102.5	102.0	103.0	102.0	102.6	102.2	101.6	102.5	104.2
28 "	102.1	103.6	102.3	104.0	102.5	102.6	101.5	103.4	102.4	103.0	101.2	103.1	102.2	103.2	101.8	103.0	102.8	102.0	102.0	104.6
1 March	101.2	102.8	101.8	104.3	101.3	102.6	101.4	104.0	102.0	103.8	101.0	102.8	101.7	103.0	100.4	102.8	101.8	102.3	101.8	101.0
2 "	101.3	103.2	102.8	103.2	101.4	102.6	102.0	104.2	101.2	103.8	101.4	104.2	101.0	103.4	101.2	103.6	101.2	102.6	105.2	103.2
3 "	101.8	102.2	102.2	102.4	101.5	102.0	102.6	103.2	102.4	103.0	102.0	104.0	102.2	102.2	102.0	102.8	101.6	102.4	102.4	103.0
4 "	101.0	102.4	101.8	102.6	101.6	103.3	102.8	103.4	102.4	103.4	102.4	102.0	101.4	103.2	102.4	102.6	101.6	102.5	101.4	103.0
5 "	101.0	102.0	102.2	102.8	102.0	103.4	101.4	104.2	101.8	103.0	102.8	101.6	101.2	103.4	101.4	102.2	101.6	102.2	101.6	103.6
6 "	101.6	104.7	100.8	101.8	102.4	101.4	102.4	102.6	102.2	101.6	101.4	102.0	102.4	102.8	102.2	101.6	101.4	102.0	102.2	102.8
7 "	102.4	105.2	100.6	101.0	100.4	101.4	101.4	101.8	101.0	102.6	100.0	101.0	101.2	102.4	100.8	101.8	100.8	101.4	101.8	102.2
8 "	104.4	...	101.2	...	101.2	...	101.4	...	102.6	...	101.8	...	102.4	...	101.8	...	101.8	...	102.2	...

A HANDY FLEAM.

WE have received from Mr. W. McIlwraith, Rockhampton, the following description of a handy fleam, introduced by Mr. Smith, Sub-Inspector of Stock at Rockhampton. The instrument appears very simple, and it is claimed for it that its use is perfectly safe and simple :—



The above are illustrations of the fleam, which Mr. Smith has fashioned, and which has been found very useful in the inoculating of cattle as a preventive of tick fever. It is used instead of a trochar for drawing blood from a "recovered" animal. It is formed of a small hammer shaft and the point of a table knife. The steel part (A) is two inches long, three-quarters broad, projects an inch from the handle, and the point is carefully ground and honed. A slit is cut in the hammer shaft as shown in No. 2, and the steel fixed with a copper washer and rivet as indicated (A). By using bend leather washers (No. 3) the depth to which the fleam can be driven is regulated; when not in use the lancet point can be protected by these washers and a cover (No. 4) made of bend leather, with a slit between the hair and flesh sides. The jugular vein of the recovered animal is made to swell by a strap round the neck; the fleam is driven by a smart tap with a little billet of wood into the vein; the blood spurts out, is caught in a pannikin, defibrinated, and used for inoculation at once. One operator says with a cheap glass syringe, a little bit of tubing, a stout inoculating needle, and fleam like this he could inoculate as safely as with more costly implements.

Forestry.

SOME TIMBER TREES OF QUEENSLAND.

No. 2.

By J. W. FAWCETT,

Member of the English Arboricultural Society.

THE SWAMP MAHOGANY (*EUCALYPTUS ROBUSTA*, Sm.).

BOTANICAL DESCRIPTION.—The Swamp Mahogany is a fine, handsome, large tree growing to a height of from 80 to 100 feet, with a diameter of from 3 to 5 feet, with many branches and a spreading head.

Bark.—The bark is rough furrowed, scaly, sub-fibrous, and of a brownish colour.

Leaves.—The leaves are usually alternate, large, ovate or somewhat egg-shaped, from 4 to 6 inches in length, very stiff and thick, and of a dark-green colour, with prominent parallel veins, the marginal one close to the edge.

Flowers.—The flowers are large, of a white or creamy-white colour, from 4 to 12 in number, on each angular or more or less flattened pedicel or flower-stalk.

Fruit.—The fruit is ovoid-oblong in shape, smooth, and often more than half-an-inch in length. They seed or are ripe about May and June.

VERNACULAR AND BOTANICAL NAMES.—The Swamp Mahogany is also called the Brown Gum-tree. The name Mahogany was given to it in the early days of Australia from the resemblance which the timber was supposed to have to the tree Mahogany of Central America, to which, however, it is in no way allied. The adjective Swamp is given to it from the situation in which it generally grows. The name Brown Gum-tree was given to it either from the colour of the bark or from the brownish colour of the kino, or gum, which exudes from the tree. The family or generic name, *Eucalyptus*, has already been explained; the specific name *robusta* is a Latin word meaning firm, robust, strong, and was given to it by Sir J. E. Smith from the size and strength of the tree.

DISTRIBUTION.—The Swamp Mahogany is found in open forests, generally on low plains, in moist, marshy, or swampy localities in the coastal districts. It seems to thrive best in sour, wet ground near the sea-coast; and where other Eucalypts look sickly in such places, this tree is always the picture of good health. In Queensland it is confined to the south-east corner of the colony, from the Brisbane River southwards to the borders of New South Wales. Its principal localities are the Logan River, Nerang Creek, and Stradbroke Island. I have never met with it north of the Brisbane River. It is almost invariably found in company with the White Ti-tree (*Melaleuca leucadendron*, Linn.). It is also found in the coastal districts of New South Wales.

USES.—The Swamp Mahogany furnishes a strong *timber* of a high quality, closely grained, and of a deep-red colour. It is difficult to split, and, for a hardwood, is rather brittle. It is generally considered, however, as not a very durable timber. It is considered a very good timber, and is much valued for

joists, wheelwrights' work, and shipbuilding purposes. It is also a useful building wood for general work, and is used in inside work and rough furniture, for implements such as mallets, and for shingles. For fencing posts it is fairly durable in damp localities.

The *leaves* furnish but little Eucalyptus oil, and are less aromatic than most other species.

It also yields but a very small quantity of *kino*, or gum, of a reddish-brown colour, and of a gummy composition. This handsome tree is generally much admired for its spreading limbs and its grand crown of noble foliage, and is one which, for ornamental purposes, deserves a place in swampy localities.

THE NARROW-LEAVED IRONBARK (*EUCALYPTUS CREBRA*, F. v. M.).

BOTANICAL DESCRIPTION.—The Narrow-leaved Ironbark is a tree of variable size. In general it is a small or medium-sized tree, but in some favourable localities it attains large dimensions. Its height varies from 60 to 100 feet, while its circumference ranges from 1 to 4 or 5 feet. The stem is tall and straight, the foliage slender and graceful, and the flower-buds, flowers, and fruits are quite small.

Bark.—It has usually a hard, blackish, or greyish-looking, rough, persistent bark, fibrous and flaky in texture, and very deeply furrowed.

Leaves.—The leaves are either alternate (or one above the other) or opposite (that is, arranged in pairs, so that one of them is immediately on the opposite side of the leaf stalk), linear or oblong-lanceolate (that is, long and narrow) in shape, straight or falcate (that is, sickle-shaped), from 4 to 6 inches in length, oftentimes thick, with numerous fine divergent veins. When dry they are often of a dull green or yellowish hue.

Flowers.—The flowers are small, and from three to six in number, arranged on short flower stalks. They are of a whitish colour, and appear in bloom in May and June.

Fruit.—The fruit is obovoid-truncate in shape (that is, somewhat in the shape of an egg), with one end terminating abruptly. It is very small, being less than one-sixth of an inch in diameter. They are ripe, or seed, from May to November.

VERNACULAR AND BOTANICAL NAMES.—The Narrow-leaved Ironbark-tree (so-called from its very narrow leaves) is also known as Red Ironbark (from the colour of its timber). Sometimes it is called Grey Ironbark (from the colour of its bark), Pale or White Ironbark, and White Narrow-leaved Ironbark. The specific name, *crebra*, is a Latin one, signifying standing together in a crowd, and was given to this tree by Baron F. von Muller in reference to the gregarious habit of the tree.

DISTRIBUTION.—The Narrow-leaved Ironbark is found growing in patches or clumps in open forests, preferring ranges, ridges, and higher lands to flat or low-lying country, and soil of a better quality than the other species of Eucalypti known as Ironbarks. It is a common Queensland tree, and is found chiefly on the eastern slopes of the Dividing Range, both north and south, extending, in places, to a considerable distance inland. Its range in Australia extends from the neighbourhood of Jervis Bay in New South Wales to the Northern Territory of South Australia. It is often found growing together with the Broad-leaved Ironbark (*E. siderophloia*, Benth.).

USES.—It is a most highly valuable tree, producing an excellent timber. The timber is whitish-coloured near the bark, with a pinkish-grey or reddish-coloured heartwood. It is hard and very tough; of strongly inlocked fibre, or closely-grained; and very durable. It is useful and valuable for many building purposes, being closer, softer, and more easily worked than the timbers of many other Ironbarks. It is also heavy and elastic, and much used in the construction of railway and other bridges, for piles, in wagon-building, for railway sleepers,

and for fencing-posts, &c. It is much esteemed by coachbuilders and wheelwrights, as it furnishes good timber for poles and shafts of carriages and spokes of wheels. Railway sleepers of this timber have been known to last as long as twenty years. It is one of the most picturesque of the different species of *Eucalypti* called Ironbarks, and is worthy of a place as an ornamental tree. It is not, however, a very fast grower.

TREES: THEIR BENEFITS TO MAN.

By R. R. HARDING,

Curator, Botanic Gardens, Toowoomba.

THERE is, perhaps, nothing which gives so much pleasure to visitors as the shade trees growing in the streets of any of the towns in the colonies. The shade received from them makes the walks cool, and the bright glare of the sun, which is so trying to the eyes, is mellowed down to such a degree that walking in the streets in the noonday becomes bearable, and even pleasant to all. These must purify and regulate the condition of the air, and there is no excuse for not planting trees about our dwellings, because the means are within the reach of nearly everyone. What a comparison between two dwellings: one with the front and back exposed to the midday sun and the westerly winds, and the other well planted with trees and shrubs where the occupier can at all times enjoy the benefit of their shade! Which is most sought after, if to let? One hardly ever sees such a dwelling unoccupied; the trees lend distinction to the meanest building, and enhance the value and grandeur of even the noblest.

A tree is indisputably the most highly developed form which vegetable life assumes. When one looks at its massive stem and branches raised from a little seed by means of which it has been drawn from the earth and atmosphere, one scarcely realises that this is merely the operation of the attractive forces, and that this mass of vegetable matter is only earth and air that have undergone transmutation. The leaves of trees, by a natural process of their own, absorb carbonic gas, which would be destructive to life if inhaled; and these in return give out oxygen gas, the life and sustaining element of respirable air. The oxygen of the whole atmosphere would, in the course of time, be consumed by the breathing of animals were it not for the singular provision which enables the leaves of the trees to supply oxygen and to keep up the due proportion which is necessary for the support of animal life; and the gases which the trees absorb from the atmosphere are usually considered plant food, and also contribute to their growth.

They also purify the atmosphere, counteracting the effects of animal life and various processes of decomposition; they also by their transpiration impart a degree of humidity to the air which surrounds them. They protect the ground from the direct rays of the sun, evaporate fluids elaborated by themselves, and cool the air in contact with them by the radiating of heat from their leaves. The leaves of deciduous trees are of such a nature that they perform more quickly than the same organs of evergreens the function of scavengers, and take into their system for purification the obnoxious gases hovering about our dwellings. Another important feature is that, owing to the deciduous trees casting their leaves every year, the new ones come fresh and full of vigour each spring, thus adding a degree of pleasure to the scene which is not always secured from trees of an evergreen character.

Take the *Eucalyptus globulus*, which appears to possess an extraordinary power of destroying miasmatic influence in fever-stricken districts. It has the singular property of absorbing ten times its weight in water from the soil, which is returned to the air in the shape of vapours rich in camphor. This is

one of the most remarkable and important trees in the whole world. The yield of volatile oil from its copious foliage is unsurpassed, and not equalled by any other tree; 1,000 lb. of fresh leaves with the twigs yield 120 oz. of pure volatile oil. Others of this family reach to 500 oz. of oil. These trees have been planted at the Cape of Good Hope, and they have completely changed the climatic condition of the unhealthy parts of that colony. It is now a well-known fact that trees planted in some insalubrious parts have improved the atmosphere, and ague and malarial fevers have become less prevalent, and that some places have become healthy after grass had been planted and got to grow. Our swamps produce abundance of vegetation, which may account for their non-malarious nature. Supposing that, owing to some peculiar circumstances, these swamps lost their coating of vegetation, an unhealthy atmosphere would most likely be generated, and malarious fevers be produced.

As we increase in population, and agriculture advances, some tree slaughter must take place to make room for crops, but if we keep on as we are going many interesting species will become extinct, and all our valuable timbers will be gone before cultivation has extended sufficiently to compensate for the absence of the uncultivated plants. We know that this is in direct contravention of Nature's laws, and equally so of human laws. This cutting down has in some countries been already carried too far. Whole districts have become arid, and droughts are frequent. So it is with us: our forest trees are gradually diminishing, and we are in most cases the direct cause of the diminution. Picture this colony without trees; it would then become arid and unfit for us to live in. Man's own acts have already made uninhabitable vast tracts that once were celebrated for their fertility. The Island of Mauritius was a resort for invalids in quest of health thirty years ago. It was known as the "Pearl" of the Indian Ocean, at that time a mass of verdure. Now, through the advance of agriculture, this has all changed. The trees are cleared away, and the ground is converted into sugar plantations. The consequence is a diminished amount of rainfall and an increased amount of dryness. With proportionate elevation of temperature, the ground has become a hard crust, split up into numerous cracks and crevices, and, under the tropical sun, noxious exhalations are given off. As moisture was no longer retained by the leaves (the trees being absent) and branches, and as the rootlets were no longer present to absorb the water, the sources of rivers and streams dried up, and now persons are attacked with a malignant fever, and die in a few days. Cannot we in this colony take this for a lesson, and consider the benefits we derive from the numerous trees surrounding us? And when we cut down a tree, let us consider well whether it can be spared, remembering that what we can cut down in a few hours has taken perhaps hundred of years to grow.

Artesian Wells.

IN every arid country there is naturally a strong inducement to resort to various means for supplying the deficiency in water. The most natural way, and the easiest for man in such a primitive stage as to be lacking higher forms of implements than a shovel and pick, was to dig a hole in the ground and lead the rain waters into it. But when better tools were invented then rocky ground presented no obstacle to the digger. He sank wells to a great depth in the solid rock. Those amongst us who have been to Cairo will remember Joseph's Well. This excavation is 165 feet deep in solid rock, and is 24 feet long by 18 feet wide. At the bottom it is excavated into a large chamber, and a second well or "winze," as miners to-day would call it, is sunk 130 feet deeper, where it reaches the water. The wonderful tanks at Aden begun by the Moors are a remarkable example of the determination of dwellers in dry countries to produce a water supply. The Chinese and Hindoos for hundreds of years have used a kind of rock-boring chisel attached to the end of a rope to bore through rock, and they still continue to adopt the same means for well-sinking. It was the French who in 1818, by the exertions of their Society for the Encouragement of Agriculture, first introduced the "Artesian" bore, so named from the system having been begun in the province of Artois in France. One of their bores at Passy is $27\frac{1}{2}$ inches in diameter, 1,913 feet deep, and discharges an uninterrupted supply of 3,795,000 gallons per day (W. Gibbons Cox, C.E.).

No more unlikely spot on earth could have been hit upon for agricultural purposes than the Sahara Desert in Africa, where thousands of men and camels have perished from thirst and sand storms. Yet in Algeria the French Government has put down over 13,000 artesian bores, with the result that immense vineyards, olive and date groves, and thousands of acres of wheat, maize, barley, &c., are successfully cultivated on what was once a barren, scorching sea of sand. Twelve million acres of Algeria owe their fertility to the artesian wells.

In Germany are found the deepest bores in the world; one in Upper Silesia was sunk to the enormous depth of 6,565 feet (or $1\frac{1}{4}$ miles), and was only abandoned owing to the loss of the chisel.

But at present we are only concerned with artesian bores in Queensland. It is a most extraordinary circumstance that, whilst European and Asiatic nations were fertilising their barren lands in this manner, in Queensland no other means were thought of for watering stock in the dry country than scooping out dams and sinking wells by hand. No bore, we believe, was put down in Victoria until 1880, when the first was tried at Sale, in Gippsland. Certainly it was only 234 feet deep, but the water rose, Mr. Cox tells us, 16 feet above the surface, and yielded a supply of 36,000 gallons per day. In New South Wales the first trial was made by the Government in 1884.

Queensland was last in the field. The first artesian bore was put down at Blackall by the Government in 1886, although attempts had been made as far back as 1882, near Cunnamulla, and at Back Creek, near Barcaldine, where the water only rose 3 or 4 feet above the surface, but yielded 175,000 gallons per day at a depth of 691 feet. The Blackall bore was once abandoned as waterless when 1,000 feet had been reached; but after the Barcaldine experiment, work was begun again on it, and at 1,667 feet a splendid flow of 300,000 gallons per diem was obtained.

Thus it will be seen that for nearly a century sheep and cattle and even human beings had been dying by tens of thousands on every occasion of drought, whilst under the feet of Australians was lying a supply of water equal to the fertilisation of nearly all its dry country, and this in the face of the fact that artesian bores had been sunk successfully in Europe, Asia, Africa, and America during all this time.

But Australia has awakened to its possibilities, and all over the land the borer is at work, creating running streams where formerly only a parched and thirsty desert was to be seen.

By the courtesy of Mr. J. B. Henderson, Hydraulic Engineer in charge of the Water Supply Department, we are able to give our readers some illustrations of the most celebrated artesian bores in the colony. The incalculable benefit which artesian water has conferred upon the colony can scarcely be realised or appreciated except by those who have seen the marvellous changes in the carrying capacity of sheep and cattle stations wrought by this beneficent means. Droughts are shorn of half their terrors so far as water is concerned, and settlement is taking place in the way of small farming in localities where no man would formerly have dreamt of even turning out a horse for a few days in a dry season.

The water has a considerable high temperature on reaching the surface, often attaining 180 degrees F., but as it flows away for miles along the watercourses it becomes cool and refreshing.

The first illustration (Plate XXX.) represents Bore No. 1 on Maxwellton Run, in the Burke district, about 100 miles due west of Hughenden, on the Flinders River. It is a private bore, and has a total depth of 1,474 feet. The continuous daily flow amounts to 1,000,000 gallons of a temperature of 126 degrees F. The bore was completed on 9th February, 1892, and steadily pours forth its precious fluid without diminution. At the surface the static pressure is very considerable, but the pressure per square inch is not stated.

Charlotte Plains Bore, No. 2 (Richmond), locally known as Cremorne, is about 30 miles east of Cunnamulla. This bore was completed in June, 1893, and water was struck at 360 feet, when a volume equalling 100,000 gallons per day issued forth. This water coming from such a shallow depth is naturally cold.

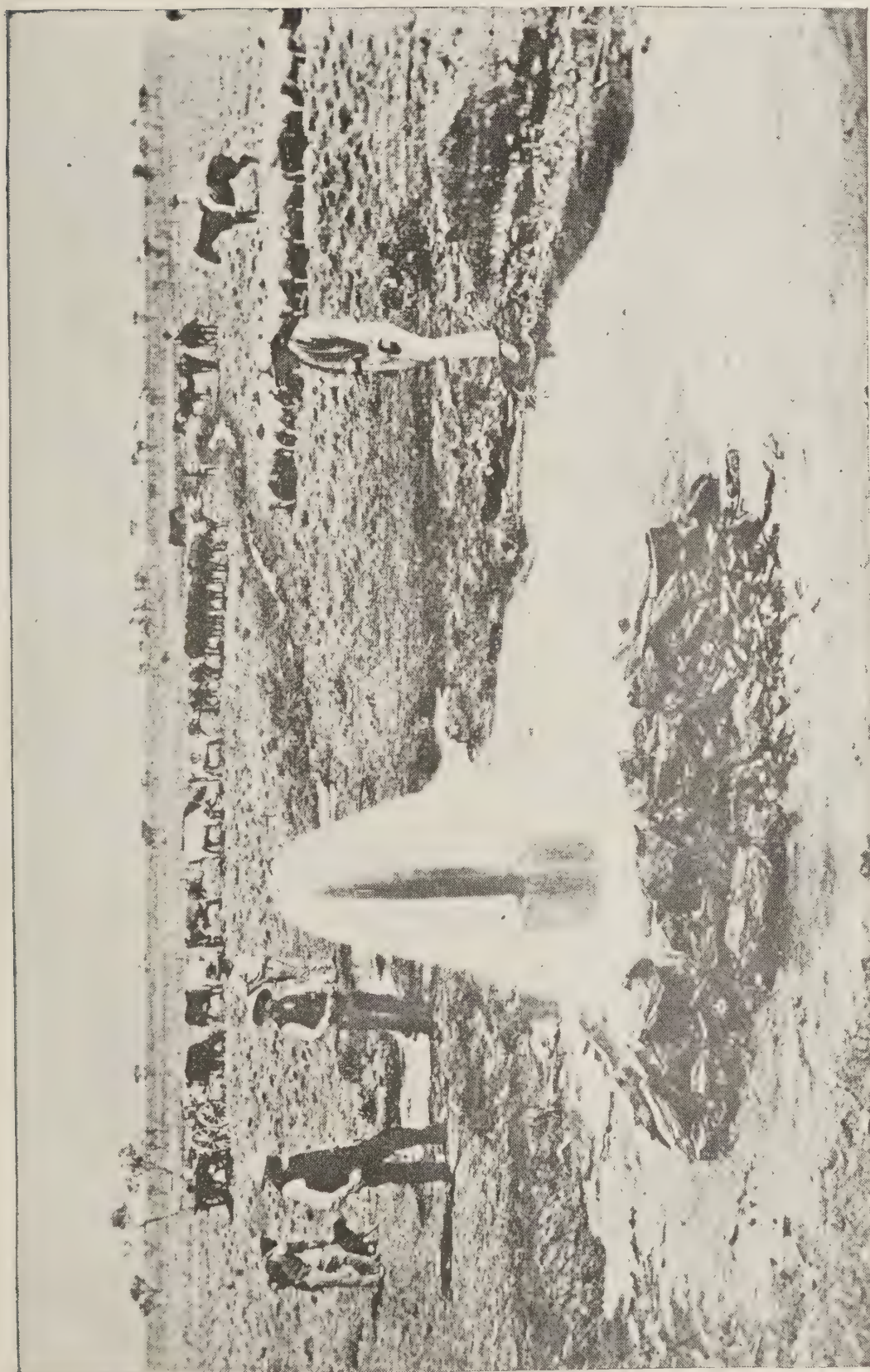
At a depth of 1,842 feet, Charlotte Plains Bore, No. 2, Cunnamulla (Plate XXXI.), yielded a supply of 2,378,000 gallons daily, of a temperature of $17\frac{1}{2}$ degrees F.

Claverton Downs No. 3 Bore (local name, Alicia) (Plate XXXII.), about 60 miles S. by W. from Charleville, is 1,819 feet deep, and the continuous daily flow is 1,500,000 gallons. As the water issues from the bore it has a temperature of 124 degrees F.

"Bluebush," the local name of the No. 2 Bore on Cambridge Downs, on the Flinders, 110 miles west from Hughenden, is the subject of our last illustration (Plate XXXIII.) This bore, which was begun in May, 1892, and completed in less than a month, yielded a supply of 400,000 gallons per day, at the shallow depth of 367 feet. Yet the temperature of the water as it flows from the pipe is 93 degrees F.

The deepest bore in Queensland is at Bimerah, in the Mitchell district. Boring was commenced in March, 1895, and by June, 1897, it had been sunk to a depth of 5,976 feet. Water was met with between 4,130 and 4,220 feet. The continuous daily flow is 25,200 gallons, at a temperature of 178 degrees F. In connection with this bore, Mr. Henderson says that since writing his Annual Report for 1897 he had received information that the owner of the bore stated the depth at 4,860 feet, and that it is in difficulties, the contractor being employed in "fishing" to remove obstacles to further boring.

Plate XXX.



MAXWELTON No. 1 BORE.

Plate XXXI.



CHARLOTTE PLAINS No. 2 BORE.

Plate XXXII.



CLAVERTON DOWNS No. 3 BORE.

Plate XXXIII.



CAMBRIDGE DOWNS No. 2 BORE.

It will be a most regrettable circumstance if this bore has to be abandoned, as it should prove one of the most interesting experiments in deep boring in the colony.

The total number of feet bored in search of artesian water in Queensland was, up to the date of Mr. Henderson's last report (June, 1897), 607,447 feet = 115.05 miles. The total number of bores catalogued by the Water Supply Department to that date was 541. Of these, 42 were sunk by the Water Supply Department, 5 by the Railway Department, 10 by local governing authorities, and 484 by private owners.

The average depth per bore is 1,122.8 feet.

The total annual flow of artesian water flowing from 349 bores in Queensland is about 140,000,000 gallons daily. This gives 52,135,000,000 gallons annually. But to give a better idea of this enormous quantity, let us explain that it would cover some 294 square miles to a depth of 1 foot, or 100 square miles to a depth of nearly 3 feet.

The power of some of the bores is used for reticulating towns, electric lighting, driving centrifugal machines for wool-scouring and other purposes. The Bando Bore, about 50 miles from Cunnamulla, is a case in point. A system of watercourses has been laid out by which water will be conveyed through a number of farms where there is good land but no permanent water. This bore is 2,090 feet deep, and yields 2,100,440 gallons of water per day. So that it will be seen that although Queensland is not blessed with running rivers like some other more favoured countries in that respect, yet we have an inexhaustible supply of underground water which on being tapped rises to the surface (and beyond it) of its own accord, and flows away for miles through the waterless plains, by means of once dry watercourses, but which now are broad running streams, supplying the thirsty flocks and herds of the squatter, who before the advent of the priceless boon of well-boring machinery, either had to look on helplessly and hopelessly whilst his stock was destroyed by thirst, or drive them many weary miles in the hope of finding some wretched lagoon or river hole where he could prolong the lives of a remnant of them.

General Notes.

THE PAMPAS-GRASS (*GYNERIUM ARGENTEUM*).

HOW TO PRESERVE THE PLUMES.

NEW articles of industry always have difficulties to contend with in the way of their general adaptation; the history of almost every product showing a prevailing prejudice against the introduction of any novelty, and many of the most important commercial products of the present day have met with great opposition at the period of their introduction. I need only refer to the tobacco plant as an illustration of my meaning; but nothing can offer greater encouragement to experiment than describing any plant of commercial value, which, if grown for the purpose of export, would tend greatly to the material wealth and prosperity of the district most suitable for its growth. While we may usually infer from the habitat of a plant whether it is suitable for a given locality or not, nothing but actual experience can determine the fact.

This grass produces a large quantity of plumes on the Downs; and if these were preserved and forwarded to Brisbane and the Northern towns, they would give good returns. There is a good demand for these plumes all over the colonies, where they are used for decoration. They can be dyed any colour; they are easily preserved, and, if done by the sweating process, they last for years without shedding their bloom—that is, if taken from the plants at the right time; for once the plumes see daylight they are useless and a nuisance in the dwelling.

The proper way to preserve the plumes is, as soon as the tips of these are seen at the tops of the plants, they should be cut off about 3 feet down the stems. Take them into some dry place; let them remain as they are for two or three days (this is to harden the stems); then strip them and wrap them in paper, a dozen or so together, for two days—if the weather is dull, longer. On a fine day take them out (you will find them very wet); spread them singly on the clean grass, which must be very clean, because the least stain touching the plumes when green shows up very prominently when cured, and be very careful that no rain or dew falls on them, or they are spoilt. If possible, they should be kept erect whilst drying, and the best plan is to put them singly into an empty bottle (no water); a wad of paper around the stem will make them fit the neck of the bottle—this is only for home use. When they are cured for export from America, they are simply cured upon the lawns. There, one lady has an avenue 800 feet in length leading to the residence, by which she realises from £700 to £1,000 a year.

They get dusty with age, but the plumes can be easily washed. This requires to be done carefully, otherwise they will be spoiled. You must have some warm soapsuds (very soapy), and into this plunge the plumes. Do not rub them, but soap all in one direction—the way of the grass. Rinse them in warm water, and wave the plumes gently to and fro till quite dry.

The Pink Pampas cannot be preserved, as they turn a dirty colour, and these are best left on the plants.

I do not know of any plants that look so nice as the pampas when in full bloom, and when the plumes are left on the plants they show up very prominently throughout the winter, just when flowers are scarce. Anyone can grow them; the smallest piece will grow, and the plants once started give no

more trouble, but increase each year. Cattle will not hurt them when once the plumes are cut, and the best way to prune them at the proper time is to burn the foliage; they will start growing immediately. The ashes feed the plants, and a difference can be seen in the next year's growth in those burnt and those pruned with the shears. In burning, we simply return to the soil what the plants had taken from it.

Preserved plumes of the Pampas-grass are advertised in the adjoining colonies at 3s. each; here is an opening for someone. Hundreds are disposed of on the Downs every year, but these, not being preserved, are very unsatisfactory to those obtaining them, for, if they get the least shake, the bloom comes off, and, after carrying the stems some distance, they are cast away in disgust, with disappointment.—R. R. HARDING, Botanic Gardens, Toowoomba.

A PATENT CASE.

EXTERMINATING THE CODLIN MOTH.

A SOMEWHAT interesting case lately occupied the attention of Mr. Acting Commissioner Stuart in the Patent Office. On 26th October, last year, Messrs. Wertheimer and Hinrichsen filed an application for a patent in respect of an improved codlin moth trap. The grant of patent was opposed by Mr. Quinn, Government Inspector of Fruit. Mr. G. H. Castle, of the Crown Law Department, appeared for Mr. Quinn; and Mr. J. Herbert Cooke, patent agent, for the applicants. The evidence showed that the idea of an appliance baited with fruit-jelly had been communicated to an officer of the bureau, and in consequence Mr. Quinn had experimentally used an extemporised trap with successful results in a private orchard just prior to the filing of the applicant's specification. Mr. Cooke quoted, *inter alia*, the case of *Hill v. London Gaslight Company* to show that experimental use as above and under some what analogous circumstances was not such a disclosure as to constitute a gift of the invention to the public, and that certain characteristic features of his client's traps were not present in the traps which were temporarily used by the inspector. The commissioner accepted Mr. Cooke's arguments in support of the case, and decided in favour of granting the patent to the applicants.

The Government Inspector of Fruit, Mr. Quinn, alluding to the above case, says the orchardists and gardeners must not imagine that the decision of the Acting Commissioner of Patents in any way precludes them from the free use of appliances baited with fruit-jelly for snaring the moths. The Acting Commissioner, Mr. J. M. Stuart, made it clear that the patent secured by Messrs. Wertheimer and Hinrichsen applied only to the addition of a flange on a vessel shaped like a tumbler. The presence of that flange renders it easier to suspend that form of receptacle, and the idea, Mr. Quinn says, is an old one. In the inspector's opinion a tumbler-shaped vessel is not the best kind of trap; he prefers a globular article, with a smaller opening, which gives the moth less chance of escape, and keeps the evaporation from the syrup at a minimum, thus causing the bait to retain its moisture much longer than it would do in a tumbler. The decision of the court, however, would not prevent the free use of ordinary tumblers, which could be suspended by wire or twine. As the codlin moth is such an inveterate foe of the fruit industry, it is highly important that horticulturists should combat it by all the means in their power.—*Adelaide Observer*.

THE German codlin moth trap is simple, and said to be efficacious. It is merely a glass jar (several of which may be placed in a tree) suspended by wires to the branches. They are inclined at an angle, and partly filled with a thick syrup of sugar and water in which a teaspoonful of apple-jelly has been mixed. The scent of the jelly attracts the moths; and, among other varieties of insects, as many as twenty and thirty codlin moths have been caught in a jar in one night.

CODLIN MOTH AND BATS.

THE *California Fruitgrower* recommends the encouragement of bats in the outbuildings, and quotes Dr. C. F. Hodge, of Clark University, Worcester, Mass., who says that in an orchard near his home he found nine grubs of the codlin moth in one minute. Chancing to visit another orchard not a mile from the first, he found only four grubs in an hour's search. The owner of the farm said that in an old barn near by lived seventy-five to 100 bats, and his apples were always free from worms. The naturalist caught a bat, and offered it some of the grubs, which were greedily accepted. The codlin moth flies only at night; so does the bat: good circumstantial evidence that the bat is a useful friend to the apple-grower.

Dr. Hodge took half-a-dozen bats home, and kept them in the parlour. They made their home in the top folds of the window draperies, flying about at night and sometimes in the daytime. From time to time, netfuls of night-flying insects were released in the room, and never a bug remained in the morning. The bats took everything, from a spider to a polyphemous moth. One morning the doctor counted while a bat devoured sixty-eight house flies.

A REMEDY FOR ORANGE RED SCALE.

MR. R. HASELGROVE writes to the *Adelaide Observer* as follows:—

A few months ago you published a recipe for killing Red Scale on orange or lemon trees. It was 10 lb. of resin, 2 lb. of soft soap, and 5 lb. washing soda put into 54 gallons of water, and boiled for a given time. My trees being badly affected I made up the mixture, but added to it sixpennyworth of quassia. After spraying the trees the foliage came off, and young shoots were affected. I added three times the quantity of water, and found it very effective. The scale has quite disappeared. Before my apple and pear trees came out in leaf I sprayed them with the strong mixture, and when in bloom I sprayed with the reduced strength. I think one trial does not prove the application to be a remedy. Last year, however, the difficulty was to find fruit not affected, but this year the disease is very limited.

A NEW WAY TO TELL A GOOD COW.

“NORTH Somerset” writes to the *Mark Lane Express*:—As science advances, more and more attention is given to details, and it is found that often what are popularly considered to be very minor points often turn out to be something of the greatest importance. As is well known in farming, to produce a good milker is considered to be somewhat of a lottery, and many a calf is reared for dairy purposes that would have been far more profitable converted into beef. Now, how are we to pick out these? I glean from a Swedish dairy newspaper—*Mejeriernas Annonsblad*—that a discovery has recently been made, the truth of which has been proved by a first-class veterinarian, that makes it quite possible at the birth of a calf to judge whether it will become a good milk cow or not. It has been observed that the palps that are on the inner side of the cheeks near the corner of the mouth have different forms, according to whether the animal is a good, a middle class, or a very indifferent milker. The palps being large, broad, and flat denote that the animal gives a large quantity of milk. If they are only round, the milk qualities are of the most ordinary description; while if they are pointed, the milk yield is of a most wretched description. Here is a chance for some English farmer, who keeps a record of the milk production of each cow, to put this statement to the test.

A QUICK-GROWING WINTER FODDER.

MR. H. A. TARDENT writes:—

The other day I received from an enterprising seedsman a small packet of Skinless or Nepaul Barley, which he recommended should be tried as a great and valuable novelty. The receipt of that packet induces me to believe that the plant is not yet so well known amongst farmers as it should be.

Last year we grew here, on the Experiment Farm, a few acres of it, with excellent results. It does not grow high—from 2 feet to 2 feet 6 inches—but it stools well, giving an abundance of juicy stems and flag excellent for green fodder. The ears, about 3 inches long, contain six rows of seeds. Those seeds are really skinless, and resemble so much a dark wheat that even millers have mistaken them for wheats. The Nepaul Bailey is extremely prolific, giving sometimes from 1,200 to 1,500 seeds from one seed. It is excellent for fowls and horses, and when fed to pigs it produces an excellent bacon. Being hard and flinty, it is not a good malting barley. Its great merit, however, is its earliness, the plant being ready to cut for green fodder in from eight to ten weeks. In this part of the colony it is better sown from March to August, inclusive.

A SUCCESSFUL CO-OPERATIVE SOCIETY.

THE *Farmer and Stockbreeder and Chamber of Agriculture Journal* (London) says:—A recent dividend of 5 per cent. does not look like proclaiming the failure of co-operative farming.

This has reference to the Aspatria Co-operative Farming Society, Limited, which, last year, received from sales £14,218; and a net profit of £146 13s. 1d. was made. Added to the balance brought forward, this allows of a dividend of 3d. in the £1 on purchasing members' accounts, and 5 per cent. interest on share capital, £65 being carried forward. The share capital of the society is £2,021, and during the twenty-eight years of its existence the capital has been returned to the shareholders three times over.

EXTRACTING MOISTURE FROM WHEAT.

A NEW process for artificially extracting moisture from wheat was put to a careful test in Berlin recently (says the *Times*). The trial was carried out at the instance of Mr. Yesburgh, M.P., who sent over fifty quarters of English wheat to be submitted to the process. The result was entirely satisfactory, over 6 per cent. of moisture being taken from the wheat—which was a very dry sample in excellent condition, while the heat to which it was subjected could not possibly affect it injuriously. The principle of the process—namely, that of drying it under a vacuum—has been applied to many articles of commerce, and the result of this trial is to show that it is equally adapted to wheat. It is hardly necessary to point out that the subject is one of great interest to farmers, who would be greatly benefited by the provision of facilities for getting their wheat into condition, particularly in a wet season.

HORSES CLICKING.

CLICKING consists in a horse catching the front shoes with the hind feet when travelling. A cure for this unpleasant habit is to under-drive the pony, keeping it, however, well up, and not allowing it to slouch along. Besides this, shoes may be specially adapted to the hind feet, having the clips at the sides instead of at the toe, the front being made thick, and brought back behind the point of the toe. This shortens the foot without danger to the sensitive parts within. When the heel is struck the noise is not heard, but the wear shows whether the action is improving.

COFFEE REFUSE.

THE *Tropical Agriculturist*, Colombo, says that a good business is done between Colombo and the Persian Gulf ports in coffee husk, which is practically refuse thrown away by planters after pulping and clearing the coffee berries. The Arabs, especially, make use of the husk in place of the civilised preparation of *café noir*. This is worth noting by our coffee-planters, and we will endeavour to obtain more information on the subject before long.



LUNG-WORMS IN SHEEP.

THE *Sydney Stock and Station Journal* states that a series of experiments have been conducted in the colony by Mr. Arthur Darby, with a view of discovering a means of causing sheep to expel lung-worms without recourse to the ordinary inter-tracheal injections. Two sheep experimented upon by him expelled from twenty-five to thirty worms each through the nostrils. It was done by an injection of milk. Sugar and water and oatmeal and mucilage were tried, but milk was found the most effective.

THE WATER HYACINTH.

MANY persons who have seen the innocent-looking and, when in bloom, beautiful Water Hyacinth, lately growing in some quantity at the Brisbane Botanic Gardens, have expressed disbelief in its injurious spreading qualities, as described by Mr. W. Soutter, Assistant Inspector of State Farms, in Volume I., Part 3, of this *Journal*. Now comes further news concerning the beautiful pest. The *Florida (U.S.) Agriculturist* says:—Captain J. W. Sackett, of the United States Engineering Corps, is at Palatka with the tug "Biscayne" for the purpose of trying a new experiment in the way of getting rid of the water hyacinths which have become such a nuisance in the St. John's River. The plan is to gather up masses of the pests with nets and tow them out to sea. The work is now going on under the supervision of Captain Sackett.

NEW CORN PRODUCT.

It appears as if cornstalks were steadily pushing their way, under scientific manipulation, to the front as a most useful product. In Illinois (United States) there is a factory where cellulose from the pith of corn is manufactured. This material is used to fill up the space between the inner skin and outer wall of battleships. It is forced into the space under great pressure, and when a shot passes through the ship's side, and relieves the pressure at this point, the compressed cellulose immediately expands and tightly closes the hole made by the ball, and thus instantly stops the leak. In manufacturing this cellulose, the cornstalks first have the outer coating stripped off by machinery. These strips are then ground into a fine meal, and, as we are informed by the *Louisiana Planter*, is used for stock feed under the name of the "new corn product."

The Maryland Station had in a previous test demonstrated that this corn-stalk shell-meal is a nutritious and valuable cattle feed, and in the tests reported in this bulletin it is compared with corn, oats, and hay as a horse feed.

In all, nine different animals have been fed on rations with the new corn product as a substitute for hay, and the only difficulty that has been experienced in feeding it was with two horses who had other horses besides them to whom hay was being fed. These animals became sullen and refused their feed, but, on their next door neighbours being placed on the same rations they were receiving, all went along smoothly. All of these horses had been somewhat accustomed to a "mixed feed," so this form of ration was not so new to them as it would be perhaps to many horses. The horse that relished this form of ration best at the start was one that had been accustomed to eating wet brewers' grains, which would confirm the observation that in feeding animals there is much in habit and custom. Those who would attempt to feed this material for the first time had probably better start in by feeding the same hay and grain which the horses had been eating as a "mixed feed," and then, after accustoming them to that, change to the other. The fact that horses ate this feed continuously for five months, and relished it more at the end than at the beginning, seemed satisfied at all times, together with the testimony of the weights, is sufficient for concluding that the new corn product is a good food for horses, and can replace hay for that purpose.

Following is a summary of the results reached in these tests:—

Timothy has proved to be less digestible by horses than by ruminants (animals that chew the cud).

Grinding oats increased their digestibility.

Cornmeal was considerably more digestible than shelled corn.

Feeding concentrated food or grain with hay decreased the digestibility of the hay.

It is impossible to maintain horses on a grain ration alone; they must have a long forage.

Making a "mixed feed" of the grain and long forage is the best manner of feeding horses.

The new corn product was better digested by horses than timothy hay.

Grinding fodder to the condition of the new corn product, or of coarse bran, does not destroy its value as long forage.

The new corn product was successfully used as a substitute for hay in horse feeding.

GLORIFYING THE HEN.

AN old crippled soldier was requested by Galen Wilson (in *Farm and Fireside*) to give his views on poultry-raising, in which the soldier was engaged. The reply was:—Eggs are always cash. They are ready for market the minute laid; and the sooner they are got to market the better. They require no cultivation, pruning, or harvesting, but are at once in a saleable condition. With plenty of eggs on the farm, there are a host of good things in the kitchen and money in the family purse. Gathering up eggs is like picking up dimes and dollars. Great is the hen that produces them. When everything is dull in winter, the egg-basket has wonderfully helped out many a poor farmer. The crops may be poor, the provisions low, the family cow dry, with a long wait for the next growing season; but the hen comes up smiling, and is ready to get a pound of tea or a sack of flour. If treated well, she will respond as readily when the snow is on the ground as when the fields are green. She is a friend to the rich and poor alike.

DRYING TOMATOES.

MR. H. A. TARDENT, manager of the Westbrook State Farm, gives the following recipe for drying tomatoes:—

There are many ways of drying that perfect esculent, and thus preserve it under a condensed form, easy to keep, easy to carry, and most handy to use.

The best I know of, so far, is the following, used for years past by Mrs. Tardent:—

Take good fleshy tomatoes, throw them into a tinned copper boiler. Boil over a moderate fire until the skins separate from the flesh; then pass through a sieve to strain off the skins and seeds. Then boil again to evaporate as much moisture as possible, without burning. Then pour on plates, saucers, or shallow dishes. (For commercial purposes, square specially made moulds are better, as the dried tablets thus pack well in cases.) The pulp should not be thicker than in half-inch layers. Then expose to sun and wind, taking care to cover the moulds with sheets of butter cloth, as flies are apt to deposit eggs in the pulp. Stir also occasionally the crust which forms on the surface, as otherwise the moisture cannot escape, and thus would engender mouldiness under the crust. The process is greatly hastened by finishing the drying in a cool oven, or, if available, in an evaporator. When the tablets are thoroughly dry, let them cool and pack in airtight boxes.

IS MALTING BARLEY A PAYING CROP?

Mr. T. MURPHY, of Swan Creek, would be disposed to answer this question in the affirmative (says the *Warwick Argus*). During the past season he grew a considerable quantity. The yield was 40 bushels per acre, and the grain realised 4s. 3d. per bushel on trucks at Swan Creek Railway Station. This is the best result we have yet heard of in the Warwick district.

SUCCESSFUL SHIPMENT OF ORANGES.

IN the early part of last month the first shipment of oranges from Maryborough was sent to Melbourne, and the result has been awaited with some anxiety in local fruit circles, both as regards the decision of the Victorian fruit inspectors and market prices (says the *Maryborough Chronicle* of 16th March). On Saturday, however, the gratifying intelligence was received by Mr. Connor that the inspectors had admitted the oranges without demur, and that they had sold at exceptionally high prices, much beyond sanguine expectations. The oranges were quite green in colour when they left Maryborough, but were of fine size and quality, and no doubt had ripened and looked well when placed on the Southern market. The local crop this year promises to be a splendid one, the fruit being unusually large and clean.

CHICKEN CHOLERA IN NEW ZEALAND.

NEW ZEALAND is industriously experimenting with chicken cholera as a rabbit exterminator. Mr. I. A. Gilruth, the Chief Government Veterinarian, has been making experiments in Otago. The wet weather, however, was somewhat against the successful demonstration of the effects of this new destructive agent. Mr. Gilruth spent a portion of his time going about amongst the farmers and instructing them how to prepare and lay the poisoned baits, and has since received some news that successful results have been obtained.

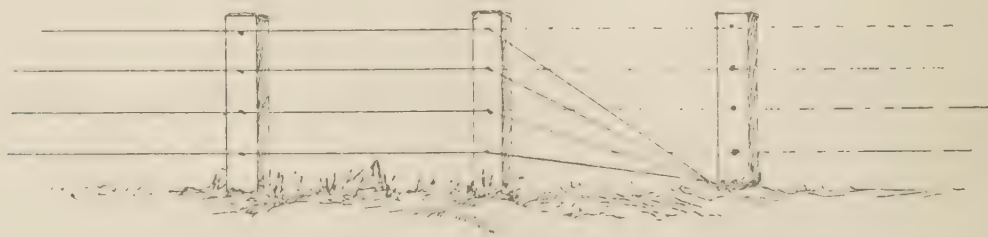
TEN REASONS FOR KEEPING SHEEP.

A LECTURER at one of the Canadian farmers' institutes recently gave the following ten reasons why farmers should keep sheep:—1. They are profitable. 2. They weaken the soil least and strengthen it most. 3. They are enemies of weeds. 4. The care they need is required when other farm operations are slack. 5. The amount of investment need not be large. 6. The returns are quick and many. 7. They are the quietest and easiest handled of all farm stock. 8. Other farm products are made more largely from cash grains, while those from the sheep are made principally from the pasture. 9. There is no other product of the farm that has fluctuated so slightly in value as mutton. 10. By comparison, wool costs nothing, for do not the horse and cow in shedding their coats waste what the sheep saves? In conclusion let me repeat—Sheep pay.*

* Sheep will not thrive or pay on our coast lands.—Ed. *Q.A.J.*

NEW IDEA IN WIRE FENCING.

WHERE a wire fence is stretched tightly (as it must be stretched if it is to be most serviceable), it is important that the post where the wires start be unyielding. Where the wires are attached to the post in the ordinary way, the post will give and the wires become slack. The cut shows an excellent



plan to keep the wires, whether barbed or plain, tight and unyielding. They all start from the bottom of the first post, close to the ground, where they have no "purchase" upon the post to draw it out of position; then pass up through staples to their proper positions on the second post, and so on along the line. Short pieces of wire are put in between the first and second posts where the dotted lines appear. This is a much simpler plan than trying to anchor the post, and put the wires on in position at the start.—*American Agriculturist*.

SERICULTURE IN VICTORIA.

OUR southern neighbour leaves no stone unturned to introduce new industries into the colony. The latest move in this direction (although it is not absolutely correct to call it a new industry) is the proposal of the Minister for Agriculture to establish a five-acre silk farm at Cheltenham on condition that the Silk Culture Association will take charge of the cultivation of the farm and the care of the silkworms.

SUGAR AND BUTTER AT LISMORE.

THE *Sydney Stock and Station Journal* says that at Lismore one sugar mill paid £120,000 last season for sugar-cane and the necessary labour to land it at the mill. In addition to sugar-growing the Lismore farmers go in largely for dairy farming. In three months 739 tons of butter were shipped from Lismore and Byron Bay.

EXPORT OF MEAT.

ON the subject of the Sydney Stockowners Meat Company's reconstruction, Mr. Francis Bacon, of Dumble, N.S.W., writes to the *Sydney Stock and Station Journal* as follows:—

With regard to chilling for export, the directors adopted Mr. Fetherstonhaugh's plan of up-country chilling and freezing hard in Sydney, instead of freezing up country or at port. The consensus of opinion amongst our most successful men is that it is cheaper and safer to freeze mutton hard at once either up-country or at port. John Cooke, Robert Richards, and Mr. Benn, the manager at Aberdeen, continue to freeze, and we hear of no cases of black-leg or damaged carcasses from their works, and, best of all, their results are good. They give us, as producers of mutton, as good, if not better, prices for our fat sheep than we can get in any other way; and yet they make it pay them fair dividends and are continuing to make it pay.

It is nonsense consigning meat to large wool firms in London. They are unsurpassed in their own business; but in dealing with meat they are forced to employ salesmen at Smithfield, and then the trouble begins. I would sooner consign to the Colonial Consignment and Distribution Company, or Weddel and Co. The same thing applies to butter. It is admitted that our Australian butter is quite equal to the best Danish, yet it fetches 2s. per cwt. less, simply because the Danes manage their business better.

EXPORT OF GAME AND POULTRY.

THE Sydney correspondent of the *Brisbane Courier* says that since November last 15,000 head of poultry have been exported to South Africa and London and bearing the Stock Department stamp as a guarantee of quality. The Board of Exports anticipate that during the coming season 550,000 hares and nearly 60,000 rabbits will be exported. Alderman Rudden, of the firm of Rudden and Sons, produce commission agents, Liverpool, states that if freight charges on poultry were reduced, the trade would be largely increased.

PREPARING CANDIED CITRON.

CITRONS grow freely and bear heavily in Queensland, but often those who have a few trees do not know what to do with them unless they happen to live within cheap railway freight or cartage distance of a jam factory. In reply to the question of a correspondent on making candied peel, the *Pacific Rural Press*, quoting from a pamphlet now out of print ("Citrus Culture in California," by B. M. Lelong, Secretary of the State Board of Agriculture), gives the following outline of the method:—The fruit, when bright-yellow, is picked and placed in barrels filled with brine, and left for at least a month. The brine is renewed several times, and the fruit allowed to remain in it until required for use—often for a period of four or five months. When the citrons are to be candied, they are taken from the barrels and boiled in fresh water to soften them. They are then cut into pieces, the seed is removed, and the fruit is again immersed in cold water, soon becoming of a greenish colour. After this, it is placed in large earthen jars, covered with hot syrup, and allowed to stand about three weeks. During this time the strength of the syrup is gradually increased. The fruit is then put into boilers with crystallised sugar dissolved in a little water and cooked; then allowed to cool, and boiled again until it will take up no more sugar. It is then dried and packed in wooden boxes.

A CURE FOR SCIATICA.

DR. C. GENNITAS, of Montpellier, has, it is said, treated a dozen cases of neuralgia of the sciatic nerve with complete success by the use of hydrochloric acid (spirit of salt).

Half-an-ounce of strong hydrochloric acid is put into a small cup; a brush, dipped into the fluid, is applied three or four times over the painful part of the nerve. The limb is then enveloped in a cotton wool dressing. Of course the application causes a somewhat severe smarting sensation, but that is quite bearable. A few minutes afterwards the skin becomes reddened and hot. Sometimes blisters are formed, but these will disappear in two or three days.

USEFUL TABLES.

Showing the number of Plants required to plant an acre of land, from 1 foot to 30 feet, from plant to plant.

Distance.	Number per Acre.	Distance.	Number per Acre.
Feet.	Number.	Feet.	Number.
30	48	8	680
28	55	7	889
26	64	6½	1,031
24	75	6	1,201
22	90	5½	1,440
20	100	5	1,742
19	120	4½	2,151
18	134	4	2,722
17	150	3½	3,556
16	169	3	4,840
15	193	2½	6,970
14	222	2	10,890
13	257	1½	19,360
12	302	1	43,560
11	360		
10	435		
9	557		

Showing the number of Plants required to plant a mile in length, from
1 foot to 100 feet apart.

Distance.	Number per Mile.	Distance.	Number per Mile.
Feet.	Number.	Feet.	Number.
100	52	25	211
95	55	20	264
90	58	15	352
85	62	10	528
80	66	9	586
75	70	8	660
70	75	7	754
65	81	6	880
60	88	5	1,056
55	96	4	1,320
50	105	3	1,760
45	117	2	2,640
40	132.	1	5,280
35	151		
30	176		

SUB-DRAINING.

The number of pipes required for thoroughly draining an acre of land is, of course, determined by the distance of the drains apart. This is shown in the following table:—

Length of Pipe.	No. of Pipes per Acre. Drains 10 feet Apart.	No. of Pipes per Acre. Drains 12 feet Apart.	No. of Pipes per Acre. Drains 15 feet Apart.	No. of Pipes per Acre. Drains 17 feet Apart.	No. of Pipes per Acre. Drains 18 feet Apart.	No. of Pipes per Acre. Drains 20 feet Apart.
Inches. 12	4,356	3,630	2,904	2,562	2,423	2,178

AGRICULTURAL AND HORTICULTURAL SHOWS.

THE Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

LIST OF AGRICULTURAL, HORTICULTURAL, AND PASTORAL SOCIETIES AND ASSOCIATIONS IN QUEENSLAND.

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Allora ...	Central Downs Agricultural and Horticultural Association	J. H. Buxton...	
Beaudesert ...	Logan and Albert Pastoral and Agricultural Society	M. Hinchcliffe ...	6 May
Beenleigh ...	Agricultural and Pastoral Society of Southern Queensland	Wilson Holliday ...	30 Sept.
Birthamba ...	South Kolan Agricultural and General Progress Association	G. W. Nixon ...	
Blackall ...	Barcoo Pastoral Society ...	F. Clewett ...	
Boonah ...	Fassifern and Dugandan Agricultural and Pastoral Association	J. A. McBean ...	28 April
Bowen ...	Bowen Farmers' Club ...	J. B. Thuman ...	
Bowen ...	Pastoral, Agricultural, and Mining Society ...	J. E. Smith ...	
Bowen ...	Preston Farmers' Association ...	R. A. Foulger ...	
Bowen ...	Proserpine Farmers' and Settlers' Association		
Brisbane ...	Horticultural Society of Queensland ...	G. K. Seabrook ...	21 and 22 April
Brisbane ...	Moreton Agricultural, Horticultural, and Industrial Association	J. Duffield ...	
Brisbane ...	Queensland Acclimatisation Society ...	E. Grimley ...	
Brisbane ...	Queensland Fruit and Economic Plant Growers' Association	G. K. Seabrook ...	
Brisbane ...	National Agricultural and Industrial Association of Queensland	H. C. Wood ...	
Brisbane ...	Queensland Stockbreeders' and Graziers' Association	F. A. Blackman ...	
Brisbane ...	United Pastoralists' Association ...	Fredk. Ranson ...	
Bundaberg ...	Bundaberg Agricultural and Pastoral Society	A. McIntosh ...	
Bundaberg ...	Bundaberg Horticultural Association ...	H. E. Ashley...	
Bundaberg ...	Woongarra Canegrowers' and Farmers' Association	H. Cattermull ...	
Burpengary...	Burpengary Farmers' Association ...	D. J. Collins ...	
Caboolture ...	Caboolture Farmers' Association ...	G. Mallet ...	
Cairns ...	Barron Valley Farmers' Association ...		
Cairns ...	Cairns Agricultural, Pastoral, and Mining Association	A. J. Draper ...	
Charleville ...	Central Warrego Pastoral and Agricultural Association	A. J. Carter ...	
Charters Towers	Towers Pastoral, Agricultural, and Mining Association	W. Tilley ...	
Clermont ...	Peak Downs Pastoral, Horticultural, and Agricultural Society	F. Leysley ...	
Cooktown ...	Cook District Pastoral and Agricultural Society	W. R. Humphreys ...	
Cunnamulla ...	South Warrego Pastoral Association ...	J. Winward ...	
Gayndah ...	Gayndah Agricultural and Horticultural Association	J. C. Kerr ...	
Gin Gin ...	Pastoral and Agricultural Society of Gin Gin	E. K. Wollen ...	
Gladstone ...	Gladstone Pastoral and Agricultural Association	W. J. Manning ...	
Gooburrum, Bundaberg	Gooburrum Farmers' and Canegrowers' Association	W. J. Tutin ...	
Goondiwindi	MacIntyre River Pastoral and Agricultural Society	A. Gough ...	
Gympie ...	Agricultural, Mining, and Pastoral Society	F. Vaughan ...	
Gympie ...	Gympie Horticultural Society ...	W. G. Ambrose ...	
Helidon ...	Helidon Scrub Farmers' Association ...	J. C. Collins ...	
Herbert River	Halifax Planters' Club ...	H. G. Faithful ...	
Herbert River	Macnade Farmers' Association...	E. C. Biggs ...	
Herbert River	Ripple Creek Farmers' Association ...	J. W. Grimes ...	
Herberton ...	Mining, Pastoral, and Agricultural Association	John M. Hollway ...	11 and 12 April
Hughenden...	Hughenden Pastoral and Agricultural Association	W. H. Mulligan ...	10 and 11 May
Ingham ...	Herbert River Farmers' Association ...		
Ingham ...	Herbert River Pastoral and Agricultural Association	Bryan Lynn ...	
Ipswich ...	Ipswich and West Moreton Agricultural and Horticultural Society	P. W. Cameron ...	
Ipswich ...	Queensland Pastoral and Agricultural Society	Elias Harding ...	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Kandanga (near Gympie)	Kandanga Farmers' Association	N. Rasmussen ...	27 and 28 July
Kolan ...	Kolan Canegrowers' and Farmers' Association	C. Marks ...	
Laidley ...	Lockyer Agricultural and Industrial Society	John Fielding ...	
Loganholme..	Logan Farming and Industrial Association ...	F. W. Peek ...	12 April
Longreach ...	Marathon District Pastoral and Mining Society	Neil McPhie ...	
Lucinda Point	Victoria Farmers' Association	W. S. C. Warren ...	27, 28, and 29 July
Mackay ..	Agricultural, Pastoral, and Mining Association	F. Black ...	
Mackay ...	Pioneer River Farmers' Association	E. Swayne ...	
Maryborough	Maryborough Horticultural Society	H. A. Jones ...	
Maryborough	Wide Bay and Burnett Pastoral and Agricul- tural Society	G. Willey ...	
Milbong ...	Milbong Farmers' Association	T. R. Garrick ...	
Mitchell ...	Mitchell and Maranoa Pastoral, Agricultural, and Vinegrowers' Association	H. J. Corbett ...	10 and 11 May 10 and 11 May
Mosman River	Mosman River Farmers' Association	..	
Mount Mee...	Mount Mee Farmers' Association	R. Thomas ...	
Nerang ...	South Queensland and Border Pastoral and Agricultural Society	W. J. Browne ...	
North Isis ...	North Isis Canegrowers' Association	W. J. Young ...	
Pialba ...	Pialba Farmers' Association	J. B. Stephens ...	
Pinbarren ...	Pinbarren Agricultural and Progress Asso- ciation	H. Armitage, senr. ...	
Rockhampton	Central Queensland Farmers' and Selectors' Association	T. Whitely, Coowonga	
Rockhampton	Central Queensland Pastoral Employers' Association	G. Mackay ...	
Rockhampton	Central Queensland Stockowners' Association	R. R. Dawbarn ...	
Rockhampton	Rockhampton Agricultural Society	R. R. Dawbarn ...	2, 3, and 4 Aug.
Roma ...	Western Queensland Pastoral and Agricul- tural Association	H. K. Alford ...	
Roma ...	Yingerbay Farmers' Association	F. E. Glazier... ..	
Rosewood ...	Farmers' Club	P. H. Adams... ..	
Springsure ...	Queensland Pastoral Society	G. R. Milliken ...	
Stanthorpe ...	Border Agricultural, Pastoral, and Mining Society	Geo. Simcocks ...	
Stanthorpe ...	Stanthorpe Horticultural and Viticultural Society	Jas. Scully ...	
St. George ...	Balonne Pastoral and Agricultural Association	T. M. Cummings ...	
Toowoomba	Darling Downs Horticultural Association ...	H. Hopkins ...	
Toowoomba	Drayton and Toowoomba Agricultural and Horticultural Society	H. Symes ...	
Toowoomba	Royal Agricultural Society of Queensland ...	F. Burt ...	6 Aug.
Townsville ...	Townsville Pastoral, Agricultural, and Indus- trial Association (formerly North Queensland Pastoral and Agricultural Association)	J. N. Parkes ..	
Wallumbilla	Wallumbilla Farmers' Association	P. W. Howse ...	
Warwick ...	Eastern Downs Horticultural and Agricul- tural Association	J. Selke ..	6 Aug.
Wellington Point	Wellington Point Agricultural, Horticultural, and Industrial Association	J. B. Blaine ..	
Woombye ...	Woombye Fruitgrowers' Association	P. S. Hungerford ...	
Woowoonga	Degilbo Progress Association	F. A. Griffiths ...	
Woowoonga	Woowoonga Scrub Farmers' Association ...	H. B. Griffiths ...	

The Markets.

AVERAGE PRICES FOR MARCH.

Article.								MARCH.		
								Top Prices.		
								£	s.	d.
Bacon	...	...	...	...	...	...	lb.	0	0	7½
Bran	...	...	...	...	...	...	ton	3	8	9
Butter, First	...	...	...	...	...	...	lb.	0	0	8⅜
Butter, Second	...	...	...	...	...	...	„	0	0	4⅞
Chaff, Mixed	...	...	...	...	...	...	ton	3	8	9
Chaff, Oaten	...	...	...	...	...	...	„	4	8	9
Chaff, Lucerne	...	...	...	...	...	...	„	2	18	9
Chaff, Wheaten	...	...	...	...	...	...	„	3	0	0
Cheese	...	...	...	...	...	...	lb.	0	0	5⅛
Flour	...	...	...	...	...	...	ton	13	5	0
Hay, Oaten	...	...	...	...	...	...	„	3	8	9
Hay, Lucerne	...	...	...	...	...	...	„	1	18	9
Honey	...	...	...	...	...	...	lb.	0	0	1½
Japan Rice, Bond	...	...	...	...	...	...	ton	16	10	0
Maize	...	...	...	...	...	...	bush.	0	3	2½
Oats	...	...	...	...	...	...	„	0	3	5¼
Pollard	...	...	...	...	...	...	ton	4	5	0
Potatoes	...	...	...	...	...	...	„	7	12	6
Potatoes, Sweet	...	...	...	...	...	...	„	2	16	3
Pumpkins, Table	...	...	...	...	...	...	„	3	3	9
Sugar, White	...	...	...	...	...	...	„	15	10	0
Sugar, Yellow	...	...	...	...	...	...	„	13	10	0
Sugar, Ration	...	...	...	...	...	...	„	11	12	6
Wheat	...	...	...	...	...	...	bush.	0	4	2¼
Onions	...	...	...	...	...	...	cwt.	0	7	10¾
Hams	...	...	...	...	...	...	lb.	0	0	10
Eggs	...	...	...	...	...	...	doz.	0	0	11⅜
Fowls	...	...	...	...	...	...	pair	0	3	0¾
Geese	...	...	...	...	...	...	„	0	5	0¾
Ducks, English	...	...	...	...	...	...	„	0	2	6
Ducks, Muscovy	...	...	...	...	...	...	„	0	3	7½
Turkeys, Hens	...	...	...	...	...	...	„	0	5	6
Turkeys, Gobblers	...	...	...	...	...	...	„	0	10	10½

Statistics.

RETURN of APPROVED APPLICATIONS for AGRICULTURAL FARMS (CONDITIONAL and UNCONDITIONAL) and GRAZING FARMS and GRAZING HOMESTEADS, under "The Crown Lands Acts, 1884 to 1895," in each DISTRICT in the COLONY, for the Year ended 31st December, 1897, showing the TOTAL AREA and FIRST YEAR'S RENT and SURVEY FEES paid thereon. Not including Selections under "The Agricultural Lands Purchase Act of 1894."

District.	AGRICULTURAL FARMS.				UNCONDITIONAL SELECTIONS.				GRAZING FARMS.				GRAZING HOMESTEADS.				TOTALS.			
	No. of Farms.	Area.	Rent.	Survey Fee.	No. of Farms.	Area.	Rent.	Survey Fee.	No. of Farms.	Area.	Rent.	Survey Fee.	No. of Farms.	Area.	Rent.	Survey Fee.	No. of Farms.	Area.	Rent.	Survey Fee.
		Acres.	£ s. d.	£ s. d.		Acres.	£ s. d.	£ s. d.		Acres.	£ s. d.	£ s. d.		Acres.	£ s. d.	£ s. d.		Acres.	£ s. d.	£ s. d.
Aranac	5	1,194	23 18 7	12 4 0	...	...	...	...	32	407,087	2,197 9 3	319 7 10	9	18,728	58 10 9	39 9 0	46	427,009	2,279 18 7	371 0 10
Banana	1	160	4 0 0	1 16 0	...	...	...	...	7	...	...	...	...	...	...	...	1	160	4 0 0	1 16 0
Bickell	9	1,545	36 17 9	16 8 8	...	...	...	...	2	58,720	212 4 0	59 17 0	4	9,624	30 1 7	16 12 0	20	69,889	279 3 4	92 17 8
Bowen	21	2,872	69 11 8	...	...	...	...	...	2	16,348	88 19 1	44 15 0	...	...	...	...	23	18,720	149 10 9	78 14 5
Brisbane	68	13,803	254 2 4	203 18 8	26	1,977	116 10 0	176 2 0	...	...	...	...	...	...	...	...	94	15,880	370 12 4	380 0 8
Bunnaberg	38	13,793	190 9 8	99 11 11	10	2,601	135 10 1	50 14 8	20	55,618	220 18 2	101 10 0	...	...	...	...	88	67,014	546 17 11	251 16 7
Cirus	9	1,133	25 16 8	42 5 9	9	1,449	75 3 8	10 11 0	...	...	...	...	...	...	...	...	18	2,582	101 0 4	132 16 9
Charleville	1	441	11 2 0	1 6 0	...	...	...	...	7	96,542	407 18 7	89 12 0	5	10,531	32 18 4	20 4 0	13	107,517	451 18 11	113 16 0
Charters Towers	...	...	...	...	...	...	...	...	1	9,000	37 10 0	8 4 0	1	2,560	8 0 0	4 4 0	2	11,560	45 10 0	12 8 0
Clonmont	13	2,372	48 10 6	19 16 8	...	...	...	...	1	26,300	100 6 3	36 5 1	1	10,240	32 0 0	15 2 10	21	38,912	180 16 9	71 4 7
Cooktown	4	619	14 9 6	11 6 0	...	...	...	...	...	...	...	...	...	...	...	...	4	619	14 9 6	11 6 0
Cumamulla	...	...	...	...	...	...	...	...	17	317,391	1,179 10 1	205 12 0	...	...	...	...	18	319,951	1,187 10 1	209 16 0
Daby	19	3,578	74 10 3	30 17 1	1	286	21 9 2	10 19 0	12	33,338	119 18 10	44 11 6	6	12,247	38 5 6	19 6 6	38	49,549	254 3 9	105 11 1
Gayndah	7	1,048	27 3 10	12 3 1	4	909	62 6 10	39 11 6	1	3,300	20 12 6	27 0 0	...	...	...	...	12	5,297	110 3 2	78 11 7
Georgetown	7	1,348	25 3 8	11 7 6	...	...	...	...	...	...	...	...	...	...	...	...	7	1,348	25 3 8	11 7 6
Gladstone	35	6,994	166 2 4	79 2 5	1	98	4 17 9	7 4 6	7	16,108	53 1 10	77 15 0	...	...	...	...	43	23,200	224 1 11	164 1 11
Goondiwindi	2	320	7 0 0	2 13 6	...	...	...	...	...	...	...	...	...	...	...	...	2	320	7 0 0	2 13 6
Gympie	98	36,619	681 3 10	241 0 8	11	1,573	112 7 5	92 19 0	...	...	...	...	...	...	...	...	109	38,192	793 11 3	333 19 8
H-beeton	2	239	6 14 8	6 13 1	5	837	38 2 4	87 16 0	...	...	...	...	...	...	...	...	7	1,106	64 17 0	34 9 1
Hogbenden	2	1,273	24 0 0	5 14 0	2	411	20 11 0	20 2 0	88	1,136,994	7,076 13 10	894 16 0	9	22,497	70 6 4	40 16 0	101	1,101,083	7,191 11 2	961 8 0
Ingoon	5	717	16 11 10	13 5 10	3	1,058	54 11 4	45 16 0	...	...	...	...	...	...	...	...	8	1,775	71 3 2	59 1 10
Inglewood	19	2,127	52 3 1	30 1 2	1	47	2 7 0	4 7 0	6	45,130	96 16 3	39 9 4	...	...	...	...	26	47,304	131 6 7	73 17 6
Ipswich	191	72,519	1,302 13 1	479 19 5	20	2,186	126 0 6	131 4 8	23	34,746	166 12 8	81 12 11	...	...	...	...	234	109,451	1,595 6 3	692 17 0
Idlori	1	160	2 0 0	9 0 0	15	1,589	113 5 4	118 0 11	31	386,162	2,683 14 1	346 18 0	24	55,860	174 11 8	100 5 6	56	442,182	2,860 5 9	436 3 6
Mackay	37	5,802	154 1 2	94 6 10	6	699	36 1 9	49 6 0	...	...	...	...	...	...	...	...	52	7,391	267 6 6	212 7 9
McTearrough	39	5,865	125 11 11	74 16 6	6	699	36 1 9	49 6 0	...	...	...	...	...	...	...	...	46	7,224	163 14 11	126 11 4
Moorilyan	19	3,371	80 0 11	45 13 10	1	160	8 0 0	9 0 0	...	...	...	...	...	...	...	...	30	3,331	88 0 11	54 13 10
N-nango	51	12,648	238 10 2	96 10 2	...	...	...	...	21	61,041	290 2 0	88 16 1	...	...	...	...	72	73,689	528 12 2	185 0 3
Port Douglas	19	2,224	55 12 5	51 6 11	13	1,155	77 11 2	116 5 0	...	...	...	...	...	...	...	...	32	3,379	133 3 7	167 11 11
Rockhampton	19	3,043	61 8 10	39 14 2	9	878	60 10 1	66 15 0	15	86,453	336 11 2	134 6 8	...	...	...	...	43	90,374	468 10 1	240 15 10
Roma	55	10,470	223 6 3	106 10 11	...	...	...	...	11	55,154	187 11 10	97 5 0	...	...	...	...	66	65,624	410 18 1	203 15 11
St. George	4	1,129	27 0 0	13 9 6	1	310	15 10 0	11 9 0	6	61,483	324 12 5	101 16 0	...	...	...	...	11	62,913	367 2 5	126 14 6
St. Lawrence	4	1,479	11 19 3	6 8 4	1	219	14 11 11	23 8 0	...	...	...	...	...	...	...	...	8	1,038	26 11 2	29 16 1
Springvale	18	6,118	98 18 3	33 19 4	5	2,289	122 8 10	55 6 0	1	4,060	12 13 9	8 0 0	6	13,172	42 5 2	22 14 8	30	25,639	276 6 0	120 0 0
Stanthorpe	6	1,132	22 4 6	26 1 0	...	...	...	...	1	5,000	15 12 6	22 10 0	...	...	...	...	7	6,132	37 17 0	48 11 0
Surat	3	780	15 12 6	4 17 2	...	...	...	...	6	59,415	202 11 9	49 5 5	...	...	...	...	9	60,195	218 4 3	54 2 7
Tambo	...	...	...	...	...	...	...	...	3	893	5 14 6	21 15 11	2	649	2 0 0	4 11 8	5	1,473	7 14 6	26 7 7
Taroom	1	160	4 0 0	1 16 0	...	...	...	...	9	49,712	118 13 6	58 4 0	...	...	...	...	10	49,872	122 13 6	60 0 0
Toowoomba	104	20,948	424 9 7	187 13 5	13	765	73 0 4	77 6 6	...	...	...	...	...	...	...	...	117	21,713	497 9 11	264 19 11
Townsville	3	794	16 8 3	17 16 1	1	27	8 4 3	4 15 0	1	1,800	11 5 0	4 0 0	...	...	...	...	5	2,621	35 17 6	26 11 1
Warwick	18	2,835	46 13 6	70 12 2	14	563	58 3 8	72 10 0	1	364	2 5 6	1 15 8	...	...	...	...	33	3,762	107 2 8	141 17 10
Winton	...	...	...	...	2	320	16 0 0	18 0 0	10	7,680	24 0 0	12 12 0	1	2,560	8 0 0	4 4 0	2	10,240	32 0 0	16 16 0
Winton	...	...	...	...	...	...	...	...	10	164,559	1,255 14 10	115 16 0	3	7,680	24 0 0	12 12 0	15	172,559	1,255 14 10	146 8 0
TOTALS	977	237,438	4,661 8 0	2,238 17 2	177	22,406	1,393 4 5	1,399 8 9	345	3,200,908	17,451 15 5	3,065 11 3	75	168,899	528 19 4	304 6 2	1,574	3,629,651	24,035 2 2	7,038 3 1

Farm and Garden Notes for May.

THE farming operations for this month may be summed up in a few words. Your land has presumably been ploughed and made ready for sowing. If sowings have not already been made, lose no time in sowing all kinds of pasture grasses, as well as wheat, barley, oats, rye, vetches, and lucerne. See that potatoes are earthed up. Cut tobacco. Those who may have a patch of cotton should now pick it. Although directions for stock-feeding do not properly come under the head of field work for the month, still farmers will do well to prepare for winter feeding of stock by utilising all kinds of green-stuff, whether in the silo or in the stack. It should be the aim of every agriculturist who owns a dairy herd to sow permanent grasses suitable to the climate and to the district in which he lives. Nearly all pastoral country in the colony is covered with indigenous grasses, and very few acres are artificially sown. In 1896 only 11,960 acres out of 336,775 acres under general cultivation were devoted to perennial grasses. A few acres of clover or other grasses form a valuable adjunct to the farm, and will support a surprisingly large number of cattle in proportion to acreage.

Kitchen Garden.—Prepare all ground by digging and manuring for successive crops. Plant out cabbages and cauliflower for a succession. Transplant onions. These may, however, still be sown, although it is late in the season. Keep the seed beds clean. Sow beans, peas, radish, lettuce, carrots, parsnips, beet, leek, rhubarb, herbs, cabbage, spinach, mustard cress, &c. Look over the celery rows. Dig and prepare beds for asparagus. Full instructions were given in the last number of the *Journal* for the cultivation of this most excellent vegetable. For those who have not got those notes, it will be of use to note that in preparing beds for asparagus the best soil must be chosen. The most favourable is a deep sandy loam, dug deep (18 inches), and well manured, a good sprinkling of salt being added a month before the planting season, that the rain and atmosphere may act upon it. Then peg out the beds 4 feet wide, leaving a path 2 feet wide on each side of the bed. Plant four rows in each bed, keeping the front rows 9 inches from the side; cover the crowns at least 3 inches with good loose soil and manure mixed; rake to a smooth surface. The plants must be 15 inches asunder. The object of having the beds so narrow is that they may not be trodden on, as, from the length of time they remain without further opportunity for deep digging, everything must be avoided which would tend to compress the earth. For old beds, cut the stalks down in May, and dig the beds lightly over with a fork, and lay over them a good dressing of manure. In September you may begin to cut; you can ensure the blanching of the tender shoots by placing earthen pipes or bamboo joints over them.

Transplant strawberries—such as Trollope's Victoria, Marguerite, and other prolific sorts.

Flower Garden.—The directions for March and April are equally applicable to May. Prepare ground that is to be planted, and, as soon as rain comes, plant out at once. Cut back and prune all trees and shrubs ready for digging. Dahlia roots may be taken up and placed in a shady place out of doors. Plant bulbs as in March.

Cultural Notes for Tropical Queensland.

[The Cultural Notes for Tropical Queensland, kindly supplied by Mr. E. Cowley, Kamerunga State Nursery, are given a month in advance, for the obvious reason that the *Journal* cannot reach some parts of the far North until the month of issue is well-nigh over, and hence the monthly notes would be valueless until the following year.]

JUNE.

PLANTING of English potatoes may be continued. Opium poppy blooming and forming capsules. Gathering tobacco leaves may be continued. Young plants of same for later crop may be planted out, if weather permits. Madagascar ground nuts may be unearthed. Gathering of teosinte to be continued and finished. Tilseed may also be gathered. Every effort should be made this month to eradicate weeds, the weather being generally favourable for this work. This is a delightful month for flower gardening, particularly where regular supplies of water can be obtained. The following annuals may be planted from seeds, with every prospect of success:—Balsams, dianthus, mignonette, zinnia, nasturtiums, gaillardias, sunflowers, coreopsis, verbenas, geraniums, thunbergia, dracenas, and petunias; the latter grow like weeds in the tropics. Matured sugar-cane, which was trashed last month, may be cut, weather being suitable. Coffee-gathering must be prosecuted with vigour; the berries are best pulped the same day as picked. Bananas to be attended to, and ripe fruits gathered; fibre may be produced from the old stems. Pineapples to be kept free from weeds; it is advisable to plant this fruit sufficiently wide to enable "cultivators" and ploughs to be used. Cultivators should be used wherever possible, thereby aerating the soil. This is a good month to build bush-houses in, bloodwood or bean-tree posts only being used. Further planting of temperate zone vegetable seeds may be proceeded with.

Orchard Notes for May.

By ALBERT H. BENSON.

THE hints given in last month's notes on the gathering, handling, and marketing of citrus fruits apply equally to the present month, with this difference, however, that even more care is required, as the riper citrus fruits become the more readily are they bruised and injured. May being usually a more or less dry month on the coast, the opportunity should be taken of cleaning up all weeds and rubbish that may have accumulated during the summer and autumn, and getting the surface of the land into a good state of cultivation, so that the comparatively small rainfall of the winter months may be conserved in the soil for the trees' growth. Unless this is done, fruit trees, especially citrus, are apt to suffer, especially if growing on shallow or badly drained soil with a retentive subsoil. Where not already done, all dead or worthless trees should be dug out; and if fresh trees are to be planted in the same place, then the holes from which the trees have been taken should be allowed to remain open, and the soil should be well exposed to the action of the atmosphere and be well sweetened. Land intended for planting during the winter should be got ready, more especially if it is new land, as it is a mistake to delay the preparation of the land too much, or to plant the trees in raw, unsweetened, and improperly prepared land. What planting has to be done, see that it is done well, as an acre of land properly prepared will pay better than twice or three times that quantity treated anyhow.

Towards the end of the month slowly soluble manures, such as boiling-down refuse or coarse bones, may be applied to the land, as they will become slowly available; and when the spring growth starts, the trees will get the benefit. Quickly soluble manure should not be applied now, but should only be used during a period of active plant growth, otherwise they are apt to be lost. Where possible, don't destroy the weeds and refuse of an orchard, unless the same is diseased, or is likely to form a bad harbour for injurious insects, but rather form it into a compost heap, preferably with lime, and allow it to become well rotten, when it will be found to be a valuable mulch for citrus and other trees in many soils; as though our soils, as a rule, are great producers of weeds, many are actually deficient in vegetable matter, so that it is a mistake to burn off all weeds, grass, or other rubbish. This deficiency of organic matter in the soil is a serious consideration, as soils deficient in organic matter are usually deficient in nitrogen, and also they are deficient in the power to retain moisture—a matter of extreme importance in a country like this, where we are subject to such long spells of dry weather.

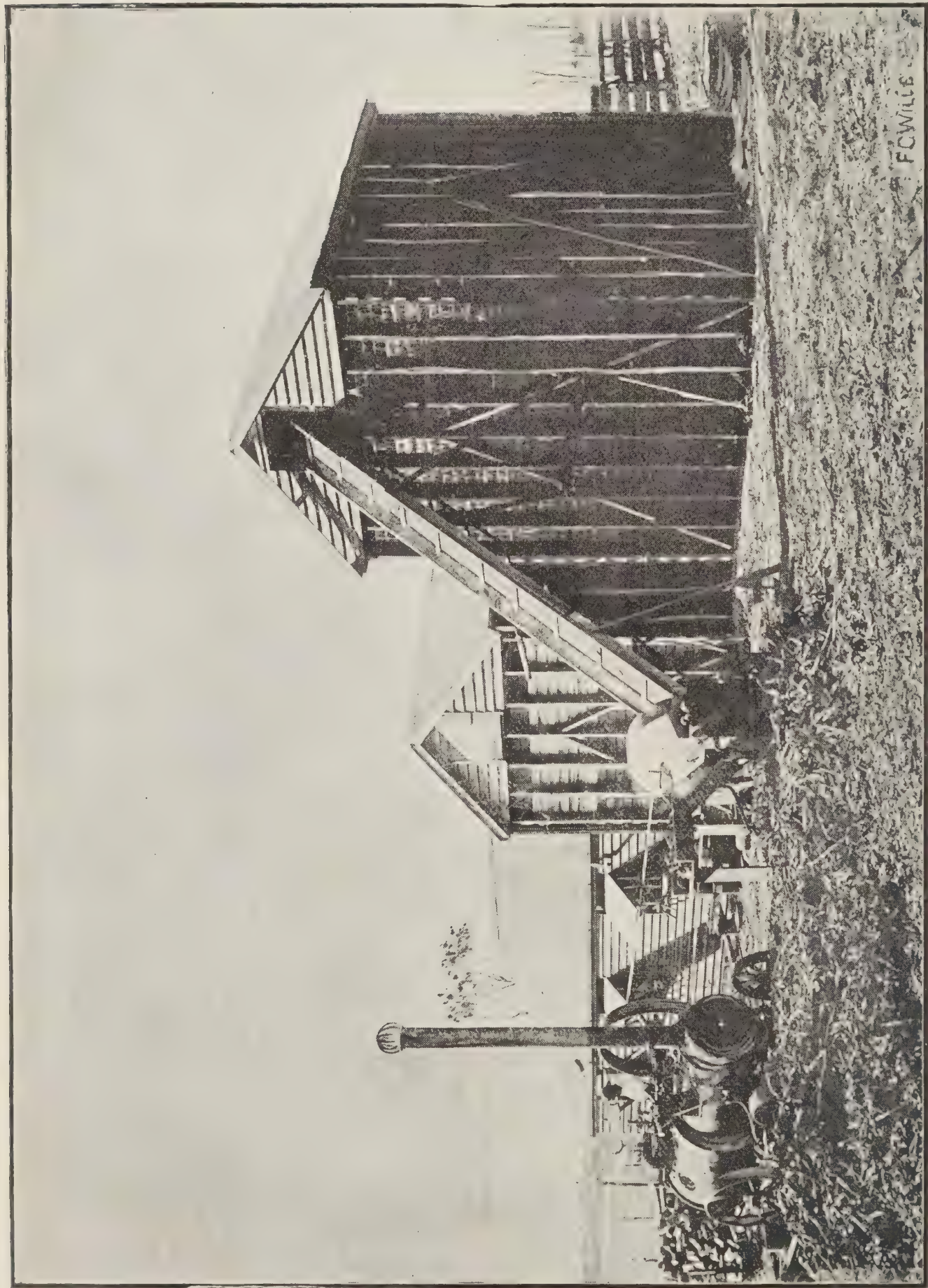
In the colder districts the pruning of deciduous trees may be commenced towards the end of the month, but in other parts of the colony it is better to wait longer, as the leaves are not off and the sap is not down. In the case of grapes, early pruning is always to be advocated where possible, as it is best to prune as soon as ever the sap is down. Pineapples, where at all subject to frost, should receive a light covering of grass or other similar material as a protection, or, where practicable, as in the case of scrub lands subject to slight frosts, they should be covered with a light framework covered with palm leaves or similar material.

Palm stems or saplings resting on forked posts, placed on either side of the bed to be protected, make a good framework ; and with palm leaves, tea-tree bush, or other similar material laid across from sapling to sapling, a very cheap and efficient protection against frost is obtained.

Gather and destroy all infested guavas, oranges, custard apple, &c., so as to destroy the larvæ of any fruit flies or moths that may be in them, as if these insects are well killed down now there will be many less to deal with next spring, and there is a chance of the earlier fruits being harvested without much loss.

Inspect all citrus and other fruit trees carefully, especially those in new districts ; and where scale insects or other diseases are found, stamp them out before they get a complete hold of the orchard, as trees can be easily and cheaply cleaned if taken in time, that will be both difficult and expensive to clean if neglected.

Plate XXXIV.



NEW SILO—QUEENSLAND AGRICULTURAL COLLEGE.

Plate XXXV.



TEOSINTE (Grown from One Seed).

Agriculture.

QUEENSLAND AGRICULTURAL COLLEGE.

NEW SILO.

AMONGST other useful work being done at the College during the month of May, the filling of the new silo is not the least important. Professor Shelton is fully alive to the great value of silage on a farm where much stock is kept, and is making ample preparation for the winter feeding of the valuable dairy herd at the College. Should the winter turn out as mild as the last one, there will not be the necessity for drawing very heavily on the silo; but there is nothing like being prepared, and a hard dry winter will thus cause no uneasiness on the score of want of feed. The new silo is a tall structure of hardwood with unlined walls of hardwood boards, well seasoned and tarred. The roof is movable, and so constructed that it will slide along an extension of the wall plates, thus allowing of the silo being filled to the top and trodden down solidly, which could not be done if the roof were fixed. Its capacity is 75 tons, and it is being filled as quickly as possible with chaffed teosinte, maize, and dal. This is, we understand, the first time that the former and latter products have been tried in a silo. Professor Shelton is sanguine that teosinte, at least, will prove to be most valuable fodder as silage. The dal is an Indian fodder plant known as pigeon pea. A description of the plant is given in this issue by Mr. J. F. Bailey, as well as an illustration of the flower, seed pod, and manner of growth. There is about an acre of the plant growing at the College, and it is now being cut for the silo.

Teosinte appears to be a most prolific plant. One stool, of which we give an illustration, grown from a single seed, produced above eighty canes which grew to a height of 10 feet. It presents a dense mass of foliage, and produces large, sweet, succulent canes. The whole of the teosinte, late maize, and dal will be got to the silo as quickly as possible. Our illustration shows the chaffing machine, elevator, and six-horse power engine driving the cutter. As fast as the chaffed fodder drops into the silo three strong lads trample it down hard. The work is warm, as the silo is naturally very close, but the lads strip to the waist, and apparently enjoy an hour or two of racing over the fodder, thus performing the necessary solidification well and conscientiously.

THE DAIRY.

Good progress is being made with the new dairy, which is a perfect model of a butter factory. The fittings and machinery are all of the most approved pattern, and as the building is roofed with tiles and floored with cement it is cooler by many degrees than any other buildings about the College premises, which have the unsightly iron roofing. One room in the dairy—the chilling chamber—has double walls, packed with sawdust, with an hermetically closing door. In the hottest day of summer this room will remain delightfully cool.

IRRIGATION.

Arrangements have been made for irrigating the whole of the extensive vegetable garden. With this view, a pulsometer pump has been placed at the edge of Lockyer Creek, to which steam is conveyed by a pipe leading down the bank of the creek from the engine. Iron pipes are laid throughout the beds about 30 yards apart, and at intervals there are standpipes fixed to them, to

which a hose 100 feet in length is attached as required, and thus water can be thrown for several hundred feet on each side of the main pipes, and the whole ground can be thoroughly saturated. A tank placed at the farthest limit of the hose's capacity can be filled by it, and the water taken to places too far distant to be reached by the present system.

There are, of course, few vegetables left, as now is the time for planting out and sowing all kinds of vegetables. This is being vigorously done. The strawberry beds have been greatly enlarged, and the young plants look very well. Mr. Górrie, the horticulturist in charge of the gardens and orchard, expresses the opinion that none of the late planted strawberries will fail to grow. The orchard looks very well, the trees making remarkable growth.

Ploughing and harrowing are going on on all sides, the students doing all the work, and doing it well, under the supervision of Mr. Quodling, the overseer.

THE LIVE STOCK

Appear to be doing very well, looking fat and docile ; especially does the latter adjective apply to the young calves, who run up and try to lick the visitors' hands.

There are now 100 pigs in the paddocks, including some well-bred boars and sows, and three sows have litters of nine and ten each.

THE LABORATORY.

We were shown over the laboratory by Mr. Brünnich, chemist at the College. It is one of the finest buildings on the ground, and is splendidly arranged for the proper instruction of the students. Long tables fitted with cisterns, taps, gas-burners, and drawers, run the whole length of the largest room. In another room the shelves are laden with all the modern appliances for analysis of soils, plants, &c., &c. A splendid new kind of polariscope forms part of the equipment, included in which is a portable fireclay furnace, with its muffles, crucibles, &c., for the analysis of metals. There is a roomy double dark room for photographic operations. In fact, there is probably everything that the most exacting scientist could require to carry out elaborate experiments and to teach on a large scale. Mr. Brünnich is justly proud of the splendid establishment under his special charge.

Generally the surroundings of the College are assuming an air of beauty and home comfort. Each house has a beautiful garden ; palms and pampas-grass have been planted, and durantia hedges are becoming greatly in evidence. The number of pupils is sixty-four, and more applications for admittance are being daily received from parents in all parts of the colony.

HEADINGTON HILL HEAD STATION.

It may be interesting to farmers who have settled on the Headington Hill lands to know what was done there in the way of farming in the good old days when Mr. C. B. Fisher owned the land, and when the late Mr. G. H. Davenport was manager in 1877. At that time the farm proper comprised 30,000 acres, of which area 1,444 acres were devoted to farm crops, the balance being utilised for stock of various kinds. The sown crops were as follow :—

Wheat	...	...	...	350 acres (100 acres cut for grain)
Cape and malting barley...				100 „
Maize	...	...	...	160 „
Lucerne	...	...	...	800 „
Prairie grass	...	...	...	30 „
Potatoes	...	...	...	4 „

The returns from this were—

Grist wheat	...	...	1,693 bushels, value	£432
Seed wheat	...	...	300 " "	75
Malting barley	...	...	2,650 " "	530
Cape barley	...	...	800 " "	160
Maize	...	...	3,500 " "	525
Wheaten hay	...	...	350 tons	1,050
Lucerne seed	...	...	6,000 lb.	300
Potatoes	...	...	20 tons	120
Total				£3,192

Returns per acre—

Grist wheat	...	...	...	16·9 bushels
Barley	...	...	...	26·5 "
Wheaten hay	...	...	...	1 ton
Maize	...	...	...	21·9 bushels
Lucerne seed	...	...	...	7·5 lb.
Potatoes	...	...	...	5 tons

Besides this, several thousand sheep were grazed on the farm, 30 horses were constantly at work, and many kinds of the best agricultural machinery were employed. There was a large quantity of lucerne hay in stack and growing. Probably the crop may be set down at 8 tons per acre per annum, Maize was a partial failure, having been sown late. Swine, poultry, pumpkins, and garden and orchard produce were not noted.

It will be seen that the market value of—

	£	s.	d.	
Grist wheat was a fraction over	0	5	1	per bushel
Seed wheat	0	5	0	"
Malting barley	0	4	0	"
Cape barley	0	4	0	"
Maize	0	3	0	"
Wheaten hay	3	0	0	per ton
Lucerne seed	0	1	0	per lb.
Potatoes	6	0	0	per ton

Showing that the prices for farm produce twenty years ago differed very slightly from the market prices of to-day, except in the matter of wheat.

These figures are absolutely correct, as they were supplied to me by Mr. Davenport from the farm books.

Taking the average return per acre all round, we find it to amount to £2 4s. 1d. gross. From this the working expenses and seed have to be deducted. This may be set down at something over £1 per acre, or, say (to bring our net return down to that of the New South Wales farmer), £2 4s., which would give a result of £1 0s. 1d. per acre as profit, which is exactly the profit realised by a farmer in New South Wales, the results of whose four years' farming of 885 acres were published in the April number of the *Queensland Agricultural Journal*.

The latter set down the average total cost of production during four years at 15s. 9d. per acre, the wheat yield at $10\frac{1}{4}$ bushels, and the average prices realised 3s. 6d. per bushel, leaving a profit of £1 0s. 1d. per acre.

At Headington Hill, however, everything was conducted on a lavish scale, and when I saw the farm it gave one more the idea of a thoroughly up-to-date English farm than of a Darling Downs farm of the earlier days. I regret that I cannot give any statistics about the sheep. They were valuable cross-breds, and no doubt realised very good prices, whether sold right out, or whether only the wool was taken into consideration.

Mr. Davenport was very generous to the few neighbouring farmers. He never demurred at lending them any farm implement they were in need of, and also helped them in a variety of other ways.—Ed. *Q. A. Journal*.

AGRICULTURAL SETTLEMENT AT THE PERA BORE.

LAST month the gratifying news was received that at Port Pirie, South Australia, water had been struck in the artesian bore, and that the flow amounted to 1,000,000 gallons daily. The value of these artesian wells is only beginning to be felt. We have shown how settlement around the sites of some bores in Queensland is increasing, and how arid country is becoming valuable as the result of successful tapping of the subterranean supplies. Now we learn that the Pera Bore, described in Vol. I., Part 3, of this *Journal* has been the means of promoting agricultural settlement in its neighbourhood. The bore is situated eight miles from Bourke, New South Wales; is 1,054 feet deep, and yields 700,000 gallons per diem. The settlers, who at first got their returns from vegetable growing, have now gone in for the cultivation and irrigation of fodder crops. Large areas have now been planted with fruit trees, such as apricots, prunes, figs, raisins, currants, &c. At the same time market gardening has been carried on vigorously. There are other bores in the Bourke district where orchards have been planted for some time, and the settlers are now drying fruit for export. There is every prospect of a large and profitable business in this direction.

THE CULTIVATION OF MUSHROOMS.

By A. J. BOYD,

Queensland Agricultural Department.

MUSHROOMS grow profusely in many parts of Queensland, and are eagerly sought after in the neighbourhood of cities and towns. Dairy farms and horse paddocks are the most prolific localities for these excellent vegetables. Growing mushrooms in the open is one of the simplest forms of gardening. All that has to be done is to prepare a bed, "spawn" it, and the mushrooms will appear in due season—namely, in the autumn. But mushrooms really grow all the year round, and may be gathered in quantities in the spring season. Hence beds should be prepared in time to admit of a crop appearing at the most suitable time. The spawn is obtained from the parent plant, and much resembles a cobweb. This is preserved in bricks made of a mixture of turf and manure, and will last a long time in this condition.

PREPARING THE BED.

During January or February a quantity of fresh horse-droppings should be collected. They must not be piled up in a heap, but rather spread out thinly under a shed until required. Dig trenches 1 foot deep and about 4 feet wide; into the trenches throw the droppings to a depth of 9 inches. Then ram or tread them down firmly to exclude the air as much as possible, thus preventing the droppings from heating too much. Now break up the spawn bricks into pieces the size of a large marble, and set them a foot apart almost on the surface of the manure. If no rain should come, give the beds a fair sprinkling of water, and a few days afterwards cover the manure and spawn with 3 inches of fine soil. In Queensland we often have heavy rains in February. Too much water is injurious to the spawn, so it would be well to provide some shelter for the beds. If the weather is suitable, within a month or six weeks after covering up the spawn with earth, tiny white buttons spring up at intervals all over the bed, the spawn being distributed in spaces about 1 foot apart. These little buttons rapidly develop into mushrooms, and in about three weeks they are large enough to cut for the market.

They do not grow steadily, but after a week or two of slow progress they suddenly begin to expand, and in a few days double or quadruple in size.

One of the strangest things about them is that they can be produced spontaneously, as it were, from a bed of manure and earth properly prepared and cared for.

Without spawn or seed of any kind, if the work is properly done, after a few weeks the mushrooms will spring up from a bed of this kind, and for about three weeks they can be gathered. But that exhausts the bed, and you will never get another mushroom from it unless spawn is introduced. It would appear that the seed is in the mixture of manure and earth naturally, and needs only proper conditions of warmth and dampness to bring it to perfection. These mushrooms produced in this way are rather an inferior grade, however, and do not compare with those raised in the usual manner from purchased English spawn.

Cultivated mushrooms also are far superior to the wild variety. The latter do not attain the size and fleshiness of the former, owing to want of proper conditions and sudden changes of temperature. To raise them in perfection, a heat of from 60 degrees to 70 degrees Fahr. is sufficient. To be palatable, they must be fresh. In very warm weather they will not keep well, and in wet weather will become maggoty. The gills (or underside of the mushroom) turn black when too old or damaged by weather, and a few black-gilled mushrooms will damage a whole basketful if they are kept together for even a whole day. They also lose their flavour, and get tough if picked for any length of time. Fresh mushrooms are very brittle, and must be picked with great care, and broken mushrooms are not eagerly bought up by lovers of this edible. In France, and I believe also in America, mushrooms are grown in cellars. In Paris there is a vast number of cellars devoted to their cultivation, and also to that of the "Champignon," a more slender kind of mushroom and of more delicate flavour. It is, however, difficult to distinguish between the Champignon and poisonous fungi of similar appearance, and many persons have suffered from eating what they, in their ignorance, had gathered for Champignons, but which were, in English, "Toadstools." I have not seen the Champignon in Queensland; but there is no reason why it should not be found here as well as the mushroom and the truffle.

CELLAR CULTIVATION.

The first requisite is equable temperature; the next, dampness; and the third, gloom. The best way to prepare the cellar is to build shelves all round the walls and in the centre, indeed anywhere, so long as room is allowed to pass between the shelves. On these shelves boxes a foot deep are placed. They may be of any suitable width and length, but they must have the depth. As soon as the boxes are in position, the next thing is to prepare the beds for the reception of the spawn. I have already shown how to prepare the bed in the open, and the same method will serve for the cellar bed, the spawn being put in a little further apart than was the case in the garden, the reason being that we shall have a larger crop on a given area owing to the superior conditions of temperature and damp. Sixteen inches is not too great a distance between the fragments of spawn. The temperature must be kept at about 60 degrees or at the most 70 degrees F., and such a temperature is easily maintained in a cellar even in our hot months. Next comes the question of dampness. This is essential. But it is not always necessary to water the beds. As before said, too much water is injurious to the spawn as well as to the mushroom. The plan adopted in Paris cellars is to water the stone or brick floor and also to sprinkle the walls. In America the same thing is done by cellar growers. I lately came across a Chicago paper in which some account was given of a celebrated mushroom-grower (W. C. Blakemon) in Chicago, who realises a handsome income by growing mushrooms in a dark cellar-like barn in the heart of the city. He has a number of boxes of earth, piled over each other, resting on shelves arranged like the bunks in an emigrant ship. Narrow aisles run between to enable him to attend to his crop. Except for the

light of a lamp he carries, all is darkness in this moist warm den. The mushrooms are not picked by hand. This often results in the top breaking away from the stem, and thus the market value is lessened. Mushrooms should be snipped off about half-an-inch below the head. A long stick with a sharp brad in the end is used to harpoon each button or formed mushroom. The area of earth space in the boxes under notice is one and a-half acres. Every morning 50 lb. of fresh, crisp mushrooms are taken from the beds and sold down town. The business is a very profitable one, and the crop never ceases. The expenses after the first outlay are not heavy. Mushroom spawn in America is worth from £1 to £1 10s. per 100 lb. It can be purchased in Queensland in small quantities for 1s. per lb. brick. But the intending grower can produce the spawn artificially in this way:—

Mix two or three kinds of dung—horse and sheep or horse, sheep, and cow dung—and heap up under cover, treading it down as the heap grows. Then cover the lot with fermenting horse-dung or with bags. In a month or six weeks, if the compost heap has not been overheated, you will find on taking out a handful of it that there are small white threads running through the dung. This is the mushroom nucleus. It will not keep, however, and should be used at once. In a stable which had not been cleaned out for some time I have found the white mushroom fibres on breaking a piece of the trampled dung. Seeing that mushrooms can be raised in any odd dark, damp shed with very little labour, and that there is always a ready sale for them in the cities, the business should be a profitable one.

MALTING BARLEY.

HINTS ON ITS SUCCESSFUL CULTIVATION.

MR. E. F. SIMS, manager of the Warwick Malting Company, Limited, writes as follows on the subject of malting barley to the *Warwick Examiner*:—

In placing before the farmers of the Southern Downs the following hints on the proper production of barley for malting purposes, I may state I am indebted for my information to the observations of my late father, Mr. J. G. Sims (who may in one sense be aptly called the pioneer of the malting industry in Queensland), and other Australian maltsters; to the experiences of local growers; and to my own experiences both before and since I have been amongst you. As so many farmers are this year making their first attempt at growing this cereal, I would strongly advise all to carefully peruse this article, on which great attention has been bestowed, and which has been revised by some of the leading and most successful barley-growers in this district. The first requirement I will treat upon is the

SEED.

To grow good barley it naturally requires good seed to start with. It may be either full-sized grain or the gradings of first-class grain, the latter being preferred by many farmers, as it takes less to plant an acre than with the larger article; but cleanliness of grain is absolutely necessary to attain best results. The seed should be short and plump, and of the Chevalier variety. It is only waste of time and labour planting the long thin grain, as the chances are 100 to 1 that you will not grow a crop that a maltster can successfully treat. There should be no admixture of Cape barley, wheat, oats, or other cereal, as is too often the case in local-grown stuff. While on this subject I would like to advise farmers against purchasing, for seed, barley that has not the foregoing qualifications. Many persons think any grain good enough for seed; but this is a great mistake and cannot be allowed to go uncorrected. Numerous orders have been received for seed barley this year, and to meet the demand the directors of the Warwick Malting Company, Limited, have had to purchase grain from South Australia, and they will offer it to farmers on

arrival at the actual cost price. Before planting, the barley requires to be soaked in a solution of bluestone as a preventive of smut. The following are the usual proportions:—To one bag of seed use 1 lb. bluestone; dissolve in sufficient water to thoroughly cover all the barley, and then spread out the grain to dry. Or, spread the grain upon a floor and sprinkle with the solution, and keep turning over and wetting until every grain is thoroughly soaked. If required for immediate use, the bluestone may be dissolved first in a little boiling water and then mixed with the cold. The next item to consider is the

SOIL.

All authorities agree that the best barley is grown upon light, loamy soils, with calcareous, *i.e.*, limestone, chalk, or marly subsoils. The light, chocolate soil of this district has proved wonderfully well adapted to the growth of good malting barley, and with the exercise of a little care and forethought it is certain that this will become one of the largest barley-growing centres in Australia. On virgin soil, and on the banks of the streams, excellent results have been attained, 40 bushels to 50 bushels to the acre are nothing new, and in some instances this yield has been exceeded. On the stiff, black soil flats occasional fair yields are recorded, but only in certain seasons, and the barley is invariably of the flinty kind and not so amenable to treatment in the malt-house as the floury kinds grown upon lighter soils. Having picked the soil, I will now go into the matter of

CULTIVATION.

Barley requires a well-pulverised soil (if possible, to the consistency of ashes). If good results are aimed at, a ploughing early in the year and cross-ploughing and harrowing before planting are almost a necessity. If the grain is sown broadcast, it will require harrowing again after, and some growers think it advisable to harrow again even after drill planting. The best time for

SOWING

is during May; the first half of this month is generally preferred by farmers. In many cases barley sown in the early part of June gives good results, and when the season is backward it would not be inadvisable to plant as late as July, but in late planting a farmer must use his own discretion. Early planted barley has a chance to get well forward and make provision for properly and gradually filling the grain with the starchy ingredients before the hot weather sets in; but in late planted barley the growth is oftentimes too quick, the grain is forced and has not the requisite period for laying up the necessary ingredients in its body, and the result is too much gluten—or, in other words, the grain is steely or flinty, which in turn makes flinty malt, and is not so easy to work or so full of the necessary saccharine compounds when it reaches the brewer's hands. In fact, many brewers refuse to touch the malt made from this class of grain. Besides, in the late sown article it is often found that the grain has not time to fill at all before the hot dry weather ripens it, and the result is the long, thin, almost empty husk—the dismay of all maltsters, and which is actually only fit for pig or horse feed. The best of seed grain can be wasted in this way. Every two (or at the outside three) years, the seed should be changed, and it is best to get good seed from some neighbouring grower. With regard to the quantity the usual amount is 45 lb. to 50 lb. to the acre if sown broadcast, and 5 lb. less if drilled; the quality of the soil must be taken into consideration, as the richer the soil the more the barley stools, and the less seed is required. In late planting a little more than the usual quantity is required, as the barley has not the time to stool so much as in early sown. If planted too thick (owing to its nature of shooting) too many stalks appear, and on account of the overcrowding the roots are unable to obtain sufficient nutriment to properly fill the grain. In England and on the Continent from 2 bushels to 4 bushels to the acre are sown, but it must be remembered that the soil is not

so rich by a long way there as is the case here. After the barley is up, the next proceeding is

ROLLING.

This is considered most important, as insuring an even growth and stronger straw. When the barley is about 3 inches over the ground a rolling should not be neglected. As soon as the crop is in ear

WEEDING

should be done. Under the heading of weeds we may class Cape barley, wheat, oats, &c., as being foreign to the crop desired, and a farmer who spends a day going through the barley and pulling out these will not be the loser, but on the other hand will gain in the extra price he will receive for the clean grain. In due time the

CUTTING

has to be attended to. This is a most important item, and many farmers err at this period. Barley must be ripe, but not be over-ripe, when cut. In the first place if the barley is not properly ripe it will shrink, and lose greatly in value, as the stocks of barley (unlike wheat or other such crops) do not contain the necessary nutritive power, after being cut, to complete the filling of the grain; also if cut before the proper time it will have a green colour. On the other hand, if allowed to get over-ripe the farmer will lose a great part of his crop on the field. A good rule to follow is to cut when hard and the farmer is satisfied it can fill no more.

STOOKING.

Immediate and proper stooking is the best course, as a shower of rain, if at all heavy, would discolour the grain if left on the ground. In

FIELDING

it is easy to much improve the grain as the dews or light showers incline it to mellow, but in unfavourable weather care must be taken that it is not stacked until thoroughly dry. If only slightly discoloured it will not greatly affect its quality or price. When

STACKING

the farmer cannot use too much care. Many remarks have been made by visitors on the careless stacking of all kinds by many of the farmers on the Downs, and much surprise has been evinced thereat, as it is to the farmer's advantage after the labour of successfully growing a crop to see that it is properly protected against the elements. The barley should not be carted until thoroughly dry and the dew off the sheaves, otherwise it is almost certain to heat in the stack and become mowburnt, which renders it unfit for use by the maltster, as this heating kills the germinating power of grain, and renders it fit only for pig food. About two months in the stacks improves the barley greatly, as a certain amount of sweating is all the time going on, and this sweetens the grain. No attempt at threshing should be made until the grain has been in stack at least six weeks. In building a stack, begin at the middle of the centre or square, and build in the form of a stook; layer the sheaves round until you have left 2 feet or 3 feet on the sides to start your outside ring, and so on, always being careful to keep the middle of the stack well filled. In this way the rain is not well able to penetrate. As soon as this is finished the

THATCHING

must be attended to. Many farmers neglect this precaution, which is often an expensive mistake to them, as it costs but little and may often mean the saving of the whole stack. Wheat straw or reeds are useful for this purpose, and are easily procurable. The

THRESHING

is an item in which there is a deal of room for improvement, and the farmers should insist upon it being properly done. In the first place after threshing wheat or other grain the machine should be cleaned before operating on the

barley stack. The machine should be opened as wide as is necessary, so that the husks of the grain are not broken at the tips. Many maltsters decline to purchase grain if in this condition, as it is almost certain to generate mould on the malting floor, and makes only a second-class malt. It is far better to leave a few awns on the barley than spoil it by threshing too close. In some cases the grains are completely broken through the centre; this shows great carelessness on the part of the operators. If there should happen to be any smut in the grain put it through the screw, not through the polisher, as this would break the smut bladders and discolour the grain. The sieves of the winnower should be set to take out all small or light grains, as this gives a more uniform and valuable result. When threshed the

STORING

of the grain claims attention. Do not store in any shed where there are weevils, as much damage can be done in a very short time. Should there happen to be a fear of this pest, keep moving the grain and thoroughly sweep the place out once or twice a day until you get it clean. Some people use different kinds of specifics, but in many cases these damage the vitality of the grain, and their use is therefore inadvisable.

CONCLUSION.

To sum up: First get the proper seed, sow in good soil (well worked); early sowing is the best, roll at the proper time, keep clean of foreign growths, cut when ripe, take care in the matter of stocking, stacking, and thatching, and see that the operators do your grain justice in the threshing. The chances are altogether in favour of you getting a good return from your soil, better in fact than can be got with any other crop at present. Barley is weighed at 50 lb. to the bushel, and prices last season ranged to 5s. for tip-top. Even in case of over-production it cannot well go below 4s. for prime. Besides we have the fact before us that other malt-houses are now in contemplation, and if there should be a good yield this season are almost certain to be built.

Should any farmer wish for further information than is contained in the foregoing, I shall be most happy to oblige him as far as lies in my power.

TERMS USED BY SHEEP FARMERS.

IN Part IV. of the *West Australian Farmers' Guide* the following useful table of terms used in connection with sheep farming is given:—

Lamb.—A sheep is called a lamb until it is weaned from its mother.

Weaner.—This term is used to describe young sheep just weaned.

Hogget.—The term hogget is applied to wethers and ewes till they are shorn as two-tooths, though some people apply the term for a few months longer. Ewes and wether hoggets off the shears are often spoken of. For the ages above this, see "Dentition."*

Wether.—A male sheep castrated when a lamb.

Broken mouth.—A term used to describe sheep whose permanent incisors have decayed.

Full mouth.—A term applied to a sheep that has its full complement of eight permanent incisors fully developed. See "Dentition."*

Stores are sheep, both male and female, in low condition, generally purchased for fattening for the market.

Cull is a sheep rejected from the breeding flock for old age, or some defect of form or fleece.

Comeback.—This term is applied to a sheep raised from a crossbred ewe from a ram of one of the original breeds. It is sometimes described as a Lincoln comeback or a merino comeback.

* *West Australian Farmers' Guide*, Part IV., page 639; and also *Queensland Agricultural Journal*, Vol. II., Part 2, page 92.

Crossbred.—Sheep bred from two distinct varieties, such as merino and any of the long-wool breeds, and merino and any of the down breeds.

Stag, or ram stag, is a ram emasculated after being used as a sire.

Yolk.—The natural grease or oily matter in the wool of sheep.

Black tip.—This is the formation of the yolk into a hard black spot on the outer edge of the fibres of wool.

Staple.—The length of the wool fibre. A long staple of merino wool may reach 5 inches, a short one be just over $1\frac{1}{4}$ inches.

Combing wool is merino wool that is sufficiently long in the fibre to be worked by the combing machine. Anything over $1\frac{1}{4}$ inches is now called combing wool. Formerly it was required to be longer.

Clothing wool is any merino wool that is under $1\frac{1}{4}$ inches in length of fibre.

Kemps are white hairs seen in badly bred merino wool. These are objectionable, as they do not take the dye like true wool, and their presence reduces the value of the wool per pound.

Lock.—This term is applied to the way the wool grows on the sheep's body. Thus, the Lincoln wool has a heavy blunt lock. Small pointed locks are not liked by sheep farmers. Such fleeces do not weigh well.

Locks.—The stained wool and coarse pieces sometimes growing low down on the thighs of merino sheep; in fact, all dirty, coarse, or badly seeded parts of the fleece are termed locks.

Pieces.—These are the parts of the fleece not sufficiently coarse, stained, or seedy as to go with the locks, and yet not good enough to go with the fleece.

Break in wool.—This is a weak spot in the fibre caused by deficient growth during a period of illness, starvation, or exposure to very severe storms. Where the break occurs the wool is much weaker than elsewhere.

Dags.—This term is applied to the lumps of manure formed on the wool under the sheep's tail, owing to the animal having scoured through a rush of young grass or other cause. Longwools are apt to have dags.

KAFIR CORN IN BEEF-MAKING.

EVERYONE knows how hard and gritty Kafir corn is, and little is as yet known from actual test of its real value as compared with Indian corn for fattening beef-cattle. In view of this fact, the experiment station at the Kansas State Agricultural College, under the supervision of Prof. C. C. Georgeson, set about an investigation of the matter, and a summary of the results is as follows :—

For the first ten days 15 steers, which had been dehorned but had perfectly recovered, were kept on good grass pasture, but without grain.

From 15th October to 3rd November (1896) they were gradually accustomed to grain feed consisting of equal parts of corn* and white and red Kafir corn. Beginning with 2 lb. per head daily, the quantity was gradually increased to 16 lb. The experiment then began by weighing the steers in three lots of five each. The five head in No. 1 lot averaged 1,036 lb.; in lot 2, 1,021 lb.; in lot 3, 1,025 lb. The three lots were put in separate yards with an open shed for shelter. Lot 1 was fed on cornmeal, lot 2 on red Kafir cornmeal, lot 3 on white Kafir cornmeal. All lots were fed the same quantities of grain and fodder. By so doing, any difference in gain could fairly be attributed to the quality of the grain.

Beginning with 16 lb. per head, the quantity was gradually increased to 98 lb. for each lot of five. For "roughness" they were fed a fine quality of Kafir corn fodder, which had matured a crop of grain, and from which the

By "corn," maize is understood.

heads had been removed. Of this they received 100 lb. daily, and what was not eaten up clean was carefully weighed and deducted on the record from the quantity fed. The steers were weighed every Tuesday morning.

Lot fed on Cornmeal.—The grain feed of lot 1 was cornmeal exclusively throughout the experiment from 3rd November to 27th April—175 days. During that time the lot gained 1,632 lb., an average of 326.4 lb. per head, equal to a daily average gain of 1.86 lb. To make this they ate an average per head of 3,254 lb. of cornmeal, value 9.64 dollars, and 1,573 lb. of Kafir corn fodder, worth 1.96 dollars, and of corn fodder and alfalfa together 286 lb., worth 45 cents. Each steer thus ate an average of 18.6 lb. cornmeal daily (all three lots were fed the same quantity), and 10.6 lb. of fodder, on which they made a gain of 1.86 lb. daily. This gives 9.97 lb. of grain and 5.69 lb. of fodder for each pound of gain during 175 days. Each pound of gain cost 3.73 cents. This lot weighed 6,670 lb. on the market in Kansas City, and sold for 4.50 dollars per 100, or 300.15 dollars. The total cost of the 290 bushels of corn they ate, including grinding, was 48.81 dollars. The first cost of the steers, cost of fodder, freight and expense of sale was 203.77 dollars. Deducting this from the total proceeds, we have left 96.38 dollars to pay for the 290 bushels of corn eaten, which brings about 33.2 cents per bushel. In other words, there was a profit of rather more than 16 cents per bushel in feeding this corn instead of selling it.

Now to see how the second lot turned out.

Lot fed on Red Kafir Cornmeal.—Lot 2 was fed exactly under the same conditions as lot 1. This lot gained 1,497 lb., an average of 299 lb. per head, or 1.71 lb. per head daily. This is 27 lb. per head less than the cornmeal-fed lot gained. The Kafir corn was valued at 30 cents per 100 lb.—the same as cornmeal. Therefore the total cost of grain is the same, 48.81 dollars. But they ate 1,000 lb. of fodder more than the cornmeal lot—not that they were fed more, but they ate it up cleaner. They ate, in fact, what the others would have wasted, and it might, therefore, be omitted from their bill; but, charging it all to them, their bill for coarse fodder was 13.33 dollars, as against 12.08 dollars for the corn-fed lot, and the average cost per lb. of gain was 4.15 cents, or 42 cents per 100 lb. gain more than lot 1. They ate 10.86 lb. of grain and 6.88 lb. of fodder per lb. of gain. That Kafir corn has a feeding value so nearly that of corn is cause for congratulation; but it comes even nearer than this, inasmuch as more of the Kafir corn was voided in the manure, and thus became available for hog-feed, and appeared again in the form of pork, which nearly balanced the account. This lot weighed 6,490 lb. on the Kansas City market, and, like the other, sold for 4.50 dollars per 100, bringing a total of 292.05 dollars. Deducting all costs as in the former case, which amounted to 198.26 dollars, there is a balance of 93.79 dollars to pay for 290 bushels of Kafir corn at 32.3 cents per bushel. There is thus only 1 per cent. difference in the price the steers paid for corn and for red Kafir corn.

Lot fed on White Kafir Corn.—This lot gained 1,563 lb., or 312 lb per head. This is 13 lb. per head more than lot 2, and 14 lb. less per head than lot 1. They had eaten 10.41 lb. of grain and 6.92 lb. of fodder for each pound of gain at the close of the 175 days. They ate their fodder up closer than lot 2. This lot weighed 6,520 lb. on the Kansas City market, which at 4.50 dollars per 100 brought 293.40 dollars. Deducting costs as before (202.57 dollars), we have a balance of 90.83 dollars to pay for 290 bushels of Kafir corn. This allows 31.3 cents per bushel, which is 1 cent per bushel more than lot 2 paid for red Kafir corn and 1.9 cents less than lot 1 paid for corn.

Other Considerations.—These facts, however, do not sift the case to the bottom. There still remains the question of the relative value of the manure for hog-feed from the three lots. In other words, how much does the steer digest of the total grain eaten, and how much is available for hog-feed? To approximate the truth on these points, the manure from each lot was gathered

and washed daily for thirty-three days at the beginning of the experiment. Without describing the work in detail, it is sufficient to say that we found that the cornmeal lot voided 5.46 per cent. of their meal in the manure; lot 2 voided 11.27 per cent.; and lot 3, 14.13 per cent. This means that the three lots made their gains on the following quantities of grain:—

Lot 1, on 15,582 lb. cornmeal, or 9.42 lb. per pound of gain.

„ 2, on 14,438 lb. red Kafir, or 9.64 lb. „ „ „

„ 3, on 13,972 lb. white Kafir, or 8.94 lb. „ „ „

That is to say, only these quantities could have been effective in the production of beef, inasmuch as the balance of the grain eaten was found in the form of good sound meal in the manure.

The trial indicates that if we could find means to render Kafir corn more easily digested, either by grinding it finer, by soaking it, or otherwise, we should have as good returns from Kafir corn as from corn, or better. Indirectly it shows that it is a mistake to feed Kafir corn whole, as only those grains which are crushed under the teeth can be of service to the animal.

Value of Droppings for Hog-feed.—In this experiment the undigested grain was not lost. To test the value of the droppings for hog-feed, seven shoats were placed behind each lot of steers on 15th December. They (the pigs) averaged, on that date, the following weights per head for the respective lots: Cornmeal lot, 166 lb.; red Kafir corn lot, 168 lb.; white Kafir corn lot, 169 lb. All these hogs were purebred Poland-Chinas, nearly of the same age. Like the steers, they were weighed once a week individually. The plan was to feed them sparingly with grain, so that they could always be urged by a good appetite to get all the grain there was in the droppings. To this end, they were fed equal quantities of grain of the same kind as was fed to the steers which they followed. If the investigations on the quantity of grain found in the droppings were correct, the hogs following the Kafir corn lots ought to make the larger gains, because they had more food, and so it was. The following table shows this:—

	Lot 1.	Lot 2.	Lot 3.
Pounds of grain fed	2,520	2,520	2,480
Pounds of feed available in manure...	705	1,475	1,842
Pounds gain of each lot	635	698	725
Pounds feed available per lb. of gain	5.07	5.72	5.96

Here, then, we have transformed into pork the Kafir corn which the steers failed to make into beef.

The steers fed cornmeal gained 135 lb. more than those fed red Kafir corn. Here we have at least 63 lb. of that difference in the shape of pork, leaving only 62 lb. to be credited to the superiority of the cornmeal. In like manner the steers fed cornmeal gained 69 lb. more than those fed white Kafir corn; but the hogs following the latter gained 90 lb. more than the cornmeal hogs, completely wiping out the difference, and giving a surplus of 21 lb. to the credit of the white Kafir corn.

When the steers were sold, each lot made a profit—lot 1 of 47.60 dollars, lot 2 of 44.98 dollars, and lot 3 of 42.02 dollars. The hogs were not all sold, but those which were sold brought 3.70 dollars per 100. On this basis the profit on the hogs would stand as follows:—Lot 1, 7.10 dollars; lot 2, 10.12 dollars; lot 3, 11.21 dollars. These amounts, added to the profit on the steers, would bring out the following for the grain fed to the respective lots of both steers and hogs:—Lot 1, 54.70 dollars; lot 2, 55.10 dollars; lot 3, 53.23 dollars.

This proves that practically Kafir corn is equal to corn for the combined production of beef and pork. Such is the result of a patiently conducted experiment, as detailed in the report of the Kansas State Board of Agriculture. We have seen how the feeding of the different lots was carried out, what the cost was of that feed, and what the final financial result was. The only thing omitted is the cost of labour during the 175 days, but presumably it was considered that the manure left during the experiments would pay for labour in caring for and feeding the steers and hogs.

THICK V. THIN SOWING OF WHEAT.

MANY farmers object to thin sowing of wheat, but this is mainly due to the fact that few of them ever sit down to calculate the area which a bushel of wheat will sow. It is, therefore, well worth their while to read what the *South Australian Journal of Agriculture* has to say on the subject. But first we give the opinion of Professor Shelton on the subject. He says:—"Wheat in Queensland is almost universally sown broadcast, either by hand or machine. There are very few grain drills in the colony, high first cost having so far been a well-nigh insuperable obstacle to their introduction. The drill saves seed, because it covers it all perfectly, and with it the seed is placed in the ground at a uniform depth, while the work of sowing and covering the seed is completed as the machine advances across the field. These, briefly, are the chief advantages of the use of the drill, as compared with broadcast sowing, and it must be admitted that they are neither unimportant nor inconsiderable. Many wheat crops are annually ruined by rains coming immediately after the seed has been broadcasted and before it has been covered."

The *Journal* mentioned says:—

How much seed per acre should we sow? This question has often been debated by farmers, but the nearest estimate of the average sowing is from 45 lb. per acre early in the season to 60 lb. later on. Some sow 30 lb. to 35 lb. and contend that this is ample to give a good crop. How many of our farmers ever think what sowing a bushel of wheat to the acre means? The standard sample, as fixed by the Chamber of Commerce, weighs 62 lb. to the bushel, and averages from 875 to 900 grains to the ounce. Fair average seed will not average more than 800 grains, while well-cleaned, plump seed will scarcely go 700 grains to the ounce or 750,000 grains to the bushel of 60 lb. A square acre contains 4,840 square yards, or 43,560 square feet. A bushel to the acre gives from fifteen to eighteen seeds to the square foot. Allowing for the failure of 25 per cent. (or one quarter) to germinate, through cracked seed, insufficient covering of soil, loss by birds, &c. (an exceedingly liberal allowance), this gives us from twelve to fourteen plants per square foot—at least twice as many as there should be. With the seed drill from 35 lb. to 40 lb. per acre is usually sown, and, owing to the fact that the grain is all properly covered, this will give nearly as many plants per acre as a bushel sown broadcast. The natural consequence of the plants being crowded is that they have to fight against each other for moisture and sustenance, with the result that they are weakly and do not stool out as they should. If only half the number of plants had to find a living on this area, they would naturally have a better prospect of developing into strong, hardy plants, would stool out well, and make as many heads as twice the number of plants in the same space, and the individual heads would also yield better. With the seed drill, 20 lb. of wheat per acre should be sufficient to sow. This would mean a saving of about 1s. 6d. per acre in cost of seed alone at present prices. There is no doubt that in the first stage of growth the thicker sowing would promise better, but as the plants matured the thinner sown would overtake the other, and would withstand the dry weather better.

Many farmers will ridicule this idea, but, if they will only try the experiment for themselves, they will have a practical object lesson of the advantages of their sowing. With the drill, a few rows—some at the rate of 20 lb., others 25 lb., and others 30 lb. per acre—could easily be sown alongside the ordinary crop, and at harvest each gathered separately, so that the exact results may be known.

Mr. H. Langberg, of Conmurra, a member of the Lucindale Branch Bureau (S.A.), put in last season White Tuscan Wheat and Thomas's phosphate together, and, owing to not knowing how to regulate the flow of seed, only sowed 15 lb. per acre. Notwithstanding this light sowing, his crop averaged 15 bushels per acre. In a discussion in the *Cultivator and Country Gentleman* on this subject, a correspondent gave his experience as follows:—I have four

men farming my land on shares, I furnishing seed and water. As the yield after a few years fell from 25 bushels to 15 bushels per acre, they asserted that it was because enough seed was not sown to the acre, so I told them to sow as much as they pleased. The man who had the newest and best land sowed 1½ bushels, two others sowed a bushel and a peck, and the fourth intended to sow a bushel, but from some cause he found when he was through that he had only sown 3 pecks. When the grain was 6 inches high, the man who sowed 1½ bushels had the finest field, as fine as any I ever saw; but at harvest time his was the shortest and thinnest, and yielded the least, while the man who sowed 3 pecks on the oldest land had the best yield of any. Where one man was sowing 5 pecks, I got him to sow a few rounds, with one-half shut off, and at harvest time (this was on old land) it was plain to see that the grain was taller, the heads larger, and it ripened more naturally. It was harvested with an automatic binder, and I found that in counting the bundles, 160 rods and back, there was exactly the same number of bundles in the one case as in the other, but the bundles on the thin sowing were the heavier. At another time, when one of the men was sowing a bushel, I had him sow 20 acres in the middle of the field, running 160 rods in length, with exactly half-a-bushel to the acre. This was treated every way exactly like the remainder of the field, and was harvested and threshed by itself, and it yielded 2 bushels to the acre more than the rest of the field. Mr. Langberg recommends that barley should be sown broadcast in preference to drilling, as it is not buried so deeply as when covered by a harrow.

All these experiments were on land that was never manured, and never had grown any lucerne. On land that has been in lucerne one or more years, it is an easy matter to get from 40 to 50 bushels per acre with from 30 lb. to 40 lb. seed.

TOBACCO CULTURE IN FLORIDA.

MR. S. POWERS, of Jacksonville, Fla., writes to the *Weed* :—

The chief seat of cigar tobacco culture in West Florida is around Quincy, in Gadsden County. In the course of three visits to that noted region, made at different seasons of the year, your correspondent acquired facts and figures which may be accepted as authentic. Most of them were obtained from Mr. W. M. Corry, the general manager of the Owl Commercial Company, who annually plant about 1,000 acres of Cuban and Sumatra tobacco, and from Mr. Curry, one of their leading men. But in this letter I will confine myself to the statements of an independent farmer who has acquired his experience on a small scale, and which is therefore perhaps more satisfactory than that of the great company above mentioned, which has the advantage of unlimited capital in supporting and carrying on its operations.

Mr. Robert Sylvester, who is now the manager of Major A. Lewis's extensive tobacco plantation at Bonifay, in Holmes County, gives the results of his experience in Gadsden County. The best soil for tobacco is a grey sandy loam underlaid by a stiff red or yellow clay sub-soil; and a nature growth of hickory, oak, dogwood, and other hardwood varieties is a good indication of the best tobacco soil. Very good results have been obtained, however, on fine land; and there are successful growers who assert that they ask nothing better than pure pine land with a rich, yellow, loamy sub-soil, such as the orange-growers delight in. Mr. Sylvester claims that the best Sumatra can only be grown on virgin soil, while Cuban can be raised on the same land in successive crops, though it is always best to alternate the tobacco year about with a manure crop, as cow-peas for instance.

The best fertiliser is cotton seed crushed and cotton-seed meal; the latter gives the plants a quick start; the former by its slower action, to feed the plants at a latter period and sustain them during the important crisis of leaf formation. About 80 to 100 bushels of crushed seed and 500 to 800 lb. of the meal should be applied per acre.

It is not sought by the most intelligent planters to secure quality by growing large leaves and many of them, but rather quality as contained in a limited number of smaller leaves; and for this reason it is always advisable to plant seed only one year, or two at most, removed from Cuba or Sumatra. To restrain the growth of the leaves, the plants are set about as follows:—Sumatra plants, 12 to 15 inches in the row; Cuban plants, first year's seed, 12 to 15 inches; second year's seed, 14 to 18 inches. This gives a leaf about large enough to yield two wrappers, and of the fine silken texture which is so much sought after. The rows should be about 3 to $3\frac{1}{2}$ feet apart.

Notwithstanding the output of the State in 1897 was two or three times as much as in 1896, prices held their own and if anything advanced a little. The average price was 25 to 30 cents per lb. for pole-cured tobacco, while some extra choice lots brought 47 cents. The sweated article, ready for the factory, in some cases brought as high as 4 dollars per lb. Of such fascinating prices the farmer, as usual, does not get his just share; the shrinkage in sweating is only about 25 per cent., and the cost is not over 15 cents per lb., so that the farmer ought to receive considerably more than he does. The remedy sought by intelligent men is to learn to sweat their own tobacco, and thereby secure the splendid prices paid by the dealer to the professional curer.

In reference to the cost of production, Mr. Sylvester states that the last crop he raised cost a small fraction over 10 cents per lb. from the seed to the market. A brother of his grew a crop of thirty-five acres at a cost of $9\frac{1}{4}$ cents per lb. The same year he sold his crop before a dozen leaves were harvested, at 45 cents per lb. The Owl Commercial Company's manager estimates the cost at about 8 cents per lb.; this is on a very large crop managed on a wholesale plan.

When the land is fertilised at the rate above mentioned the Sumatra yields, on an average, 700 to 800 lb. per acre, and as high as 1,300 lb. have been grown on small and very choice plantings. Cuban tobacco yields, on an average, 500 to 600 lb., and has been known to reach 900. From these figures it can readily be seen that the skilful and industrious grower, who gives his crop unceasing attention, can count on a profit of 200 dollars to 300 dollars an acre, while a net cash return of 100 dollars per acre is not above the average to a farmer who has "any kind of a crop."

TOBACCO CULTURE.

ANOTHER old and experienced tobaccoist writes on tobacco cultivation as follows:—

My experience has been that one of the best beginnings is first to locate suitable land, well exposed to morning and noon sun. This location applies also to plant land, and should have our careful attention, for we cannot expect a good crop taken without a good planting of good plants.

I recommend for a plant bed a location as near by a water stream as you can, as you may need to water your plants, and that the bed be on rich, fresh, moist land. Clean off all the shrubbery; grub up the small undergrowth; rake clean, and when the bed is dry (not too wet, to bake when burnt) burn to a light crust with brush or small wood. After burning, dig deep with a narrow grubbing hoe, leaving the top soil on top as much as you can; then chop fine with a weeding hoe, rake off all roots, &c., and sow seed—one heaping tablespoonful to 100 square yards—then rake lightly, and pack or roll smoothly; then canvas bed or cover with small brush—canvas is best; let this covering remain until the plants are the size of a nickel coin, after which remove the covering, when you have warm sun, and cover at night while frost is likely. If dry, water plants late in the evening; and one week or ten days before planting leave bed uncovered. This toughens the plants, and will help them much in starting from the hill when transplanted.

Beds should be burnt as early as possible, and seed should be sown at the same time. This gives the plants time to form branch roots; and will greatly benefit the plant in starting from the hill. Late plants are tender and less able to start off; while the top is sufficiently large you find them with very little roots. With good plants and well set, you have much in your favour for an early cutting.

QUEENSLAND TOBACCO.

INTENDING tobacco-growers this season are fortunate in having the assistance and advice of so experienced an expert as Mr. Nevill. If his directions are properly carried out, we shall not have to fear such a result as attended a recent shipment of Queensland tobacco to London by the s.s. "Duke of Argyll," which left Brisbane on the 26th February last. The tobacco has been landed, and the leaf was examined by experts, who spoke very unfavourably of it. They declared the leaf to be coarse and deficient in flavour, and valued it at from 3d. to 3½d. per lb.

This result is possibly owing to sowing unsuitable varieties, and to want of selection and grading. If tobacco is ever to become a staple export from this colony, these details should be carefully attended to. Mr. Nevill says there is no reason whatever why Queensland should not produce as good tobacco as is produced in the United States and in Cuba. It depends entirely on the care and judgment of the grower. Therefore obtain first-class seed, suitable land, good advice from those who thoroughly understand the business, attend to proper curing and grading, and good results are bound to follow. Some tobacco-leaf of special quality for cigar-wrapper was lately sold in the United States at one dollar (4s. 1d.) per lb. But this was sweated and made ready for the manufacturer.

REVIVAL OF THE TOBACCO INDUSTRY.

THE *Border Post* says:—"It is quite evident that there will be a shortness of supply of tobacco leaf this year. A Brisbane manufacturer, when at Texas lately, arranged for some leaf at 8d. per lb., but the majority of growers are inclined to wait, as they know there will be no danger of the market being glutted. There are only about 100 tons grown in the valley of the Dumaresq this year, and a ready sale can easily be found for that amount. Messrs. Way Hop and Co. disposed of about 5 tons last week at a satisfactory figure."

Perhaps it will be news to tobacco farmers at Texas and elsewhere to learn how the war between America and Spain is likely to affect the industry. From the *U.S. Journal* we take a few remarks on the subject of Cuban tobacco export:—

WILL EXPORTS BE STOPPED?

The report to the effect that the Spanish authorities in Cuba have reinstated the "bando" imposed by Gen. Weyler against the exportation of tobacco has brought a large number of inquiries to the State Department, to which the stereotyped reply has been made that no information has been received here which would indicate that there is any basis for the report. This is only half the truth, for while the Department has learned that no formal edict has been put in force, the confidential advices received from Consul-General Lee indicate clearly that Gen. Blanco has taken no steps to expedite exports, but, on the contrary, has encouraged the local Customs officials to provide additional "regulations," the purpose of which is to embarrass exporters and decrease the quantity actually shipped out of the island. The special purpose of these restrictions seems to be to enable the Governor-General at any moment to stop exportations without the formality

of issuing another edict, hence it need not be surprising to the trade to learn at any time that exportations have been practically prohibited. State Department officials are inclined to believe that no such action will be taken by Blanco at the present time in view of the hostile construction that would be put upon such an Act by the American people, whose temper has been brought to a severe tension by the incident of the disaster to the "Maine." Importers will do well to keep in close touch with representatives in the island, and to remember that, in the event of the proclamation of another edict, the State Department, in the absence of actual hostilities, would probably be able to secure the exportation from Cuba of any tobacco actually contracted for prior to the date of the new "bando."

WHEAT-GROWING AT EMERALD.

THE Under Secretary for Agriculture, Mr. P. McLean, after attending the late Pastoral and Agricultural Conference at Rockhampton, paid a visit to the new Gindi Experiment Farm, thirteen miles from Emerald. The farm is under the charge of Mr. Alex. Watt, a well-known farmer and sugar planter from the Logan district. Mr. McLean states that operations on the farm are proceeding in a most satisfactory manner. Forty acres of land have been broken up, and will, by the time this number of the *Journal* appears, have been sown with wheat. The site of the farm has been judiciously chosen, and in a very short time the Department of Agriculture will be able to demonstrate that wheat can be satisfactorily and profitably grown in the Central districts. Of this, Mr. McLean has never had any doubt since he first saw the land many years ago. He expresses himself confident of a great future in agriculture, and especially in wheat-growing, for these districts. Mr. Lamb, a delegate from Warwick to the Conference, expressed the same opinion; and as Mr. Lamb has had large experience in wheat-growing on the Darling Downs, his opinion should carry much weight. The Hon. J. V. Chataway, Minister for Agriculture, also inspected the farm, and was quite satisfied that good work is being done, and that the farm will be of great service to the farmers of the Central districts by directing their operations in the right channel.

THE WAR AND WHEAT.

AUSTRALIAN wheatgrowers are in luck's way just now. A month or six weeks back everything pointed to a disastrous "slump" in wheat. The Sydney market became very "sick," and millers finding it difficult to sell their flour were very sparing buyers of wheat. The export demand alone postponed the evil day. Now, however, the outbreak of war has quite reversed the picture. Still, though circumstances have changed very materially in the interval, we again advise farmers to sell. We do not say sell all, but lighten your stocks. Had farmers not freely met the export inquiry during the last three or four months, the present rise would not have been possible. And now that the market is up it is as well to review the altered state of affairs. Spain has not got any sort of a fleet worth talking about, and she cannot afford to spread her vessels all over the known seas. Therefore American grain ships are more likely to be interfered with when they near Europe than anywhere else. Between 'Frisco and Sydney there's little risk. So the tendency will be for wheat to come this way rather than to Liverpool or Antwerp. California may have a poor crop this season. They have had a bad drought, and it looks like a diminished yield. Still even with a crop that is looked upon as a failure the exportable surplus is still enormous. When once the 'Frisco markets recover from the war scare, and stocks begin to accumulate, they will forage round for the nearest and safest market. Sydney is not unlikely to receive their kind attention, and

there may be heavy shipments Australia-wards in August, September, October of this year. Therefore we say accept the good prices now offered. If you have 5,000 bags, make up your mind to sell, say, 1,000 bags a month, and do it. If the market does by chance improve, you'll do better than if every farmer in the country holds on and millers have more offering to them than they can handle.—*Farm and Dairy*.

RICE IN THE NORTH.

WE are informed that a rice crop on the Barron River, recently cut, gave a return of 2 tons per acre from twelve acres. We are not, however, aware whether this means return of "padi" or of cleaned rice. If the latter, then rice should prove a more paying crop than sugar. There can be no question that the climate and soil of parts of the North are eminently adapted to the cultivation of both hill and swamp rice.

Dairying.

WHEN a man can cause the public to think on any subject pertaining to the welfare of their business, whether by writing to the Press or by lecturing, or better still by his example, that man is doing a service to his country. There are men who say dairying does not pay. Others, on the contrary, maintain that few industries pay the farmer so well as dairying. Both are right. Dairying will never pay some people, whilst to others it will bring prosperity and comfortable incomes and homes.

There are three great principles which make for success in dairy farming. These are: Breed, feed, and trouble. Breed from the best milking strains procurable. Get a sire with a milking strain record, one whose ancestors have a *bonâ fide* milk record. Breed from the best cows in the herd, and as soon as you find that a cow cannot make butter enough to reduce the cost of production to an undoubted paying point weed out that cow. Feed the good ones on food that has as much bulk as possible, yet full of nutritious matter, such as ensilage or corn that has been field-cured. Some people will say their land won't grow corn. That means that *they* won't grow corn. They have 10 acres of land, and they get together thirty or forty scrubby cows, which they turn out on to the roads to pick up the living which the dairy farmer (?) should supply for them. There is very little land so poor on a farm that it cannot be made to produce corn, not marketable as grain, but good for the silo. Teosinte, the millets, and a variety of fodder crops can be grown on poor land with the help of manure and labour. No man who will not feed his cattle has a right to keep any. In the wheat districts, bran is always procurable, and it is an excellent food for producing milk. Roots, such as mangolds, grow well in Queensland, and can, with a little trouble, be produced on most soils (excepting, of course, on sour undrained flats, sandy or rocky soils). But take the ordinary kind of land occupied by the selector of eighty or 160 acres, and there is bound to be some of it fit, if properly handled, to grow crops suitable for cattle feed.

Study the food question and feed intelligently, and do not jump to conclusions that dairy farming will not pay, because you have allowed it to cost you 8d. or 10d. per lb. to make your butter.

Handle the good cows as they should be handled. Give them plenty of wholesome food to eat, good water to drink, bedding to lie upon during cold winter nights, and paddocks with sheltering trees to pick in during the day. Use a Babcock milk-tester on them all at intervals during the year, and find out thus what they are doing. Use a separator to skim the milk, and get all the butter fat out of the milk, instead of leaving 1 lb. of fat in every 100 lb. of skim milk, as is done in the old system of setting the milk and taking off the cream with a skimmer; 1 lb. of fat left in the skim milk is worth 10d., and that is lost. No wonder it costs some so-called dairymen 10d. per lb. to produce butter.

Some will say that it does not matter if a quantity of butter fat is left in the skim milk, because the calves and pigs get the benefit of it; but a man cannot know much about his business if he thinks it will pay to feed pigs on food worth 10d. per lb.

Now, as to the man who produces butter at a cost of 10d. or 8d. per lb. The butter made by that man is most likely to fetch only 4d. or 5d. in the market, owing to his careless and old-fashioned manipulation. To figure the whole thing out in a business-like way:—

For argument's sake, let us assume that it costs in Queensland £6 5s. per annum to keep an average cow, provided she is fed and housed as she should be fed and housed. How much butter will this cow produce in the year? That

is the crucial question. Does she yield 100 lb. of butter in the year? If that is the result, then we find that it costs £6 5s. to produce that 100 lb. of butter; and if that butter is sold at 10d. per lb., her owner finds himself £2 1s. 8d. in debt by keeping her.

Now, if she produces 150 lb., then at the sale price of 10d. per lb., the owner comes out just even. His cow has cost £6 5s. to keep, and his butter fetches £6 5s., but no account is taken here of the year's labour. Taking that into consideration, he is yet in debt to the amount of the value of his labour.

Does the cow produce 200 lb. of butter? 200 lb. at 10d. is £8 6s. 8d. This has now cost him only 7½d., say, to produce, so that he comes out £2 6s. 8d. to the good.

If she produces 250 lb. of butter, the cost of production is still further lessened, say, to 6d. per lb. Thus, while his butter sells for £10 8s. 4d., the owner has only expended £6 5s. on the cow, and has realised a profit of £4 3s. 4d. Now, which kind of cow does it pay best to keep? A scrubber, which will at best give 100 lb. of butter per annum, or a well-bred beast which yields 250 lb.? The answer is obvious.

Cows capable of producing 250 lb. of butter yearly are not rare in this colony, and every dairyman should have them.

CROSS-BREEDING IN AUSTRALIA.

By "ARAB."

IN your issue of April you publish a paper by Mr. Robert Bruce on "Hints as to New Breeds of Cattle."

It is a pity that our Australian experience in cross-breeding should be left unobserved and unrecorded; properly observed and recorded, it would be most valuable for collation for educational purposes.

The present-day facilities of transit and communication, together with the wealth of our grazing industry, has allowed of many fads, fancies, or experiments in breeding being practised; then the necessities of the early colonists compelled them to get stock from anywhere they could be had at lowest cost, Africa, America, Europe, and Asia being drawn upon for supplies.

This has resulted in a singularly rich and varied experience in cross-breeding, and we have not done with it yet, if we may judge from the rapid increase of late of Jersey and Ayrshire types amongst our herds.

In this connection the publication of Mr. Bruce's paper may do good. Many small graziers, owing to the low price of fats, are going for milk, and (though loth to lessen the value of their herds for butchers' purposes, as meat values may, like spring, come again) think there is no other way of obtaining milk but by going on the hard barebones lines of Ayrshire or Jersey.

If Mr. Bruce's paper serves to convince those men that they may retain the butcher's value of their herds, and have them equally as valuable to the dairyman as barebones Jersey and Ayrshire, it will be a most opportune publication.

I contributed to your *Journal* two papers bearing on the same matter previously, and for seven years past I have with most satisfactory results been practising what I preach. If those papers serve to arrest the wholesale deterioration of our herds for meat-producing purposes—by the introduction of such highly specialised specimens as the Jersey and Ayrshire undoubtedly are—they will serve a good purpose.

I have no desire to reflect on the intelligence and practical knowledge which, combined, has gone to specialise the Ayrshire and Jersey herds, which are singularly well fitted for the circumstances under which they were formed and specialised, but still maintain that they are not best adapted for our more generous surroundings as to climate and pasturage.

A highly specialised breed of any animal cannot so readily, safely, or with profit be adapted to altered surroundings as one which is less highly specialised. Instances to illustrate this might be given in great number; let a few suffice. Take the Shorthorn, as he has been specialised to be solely a beef-producing machine. With a nutritious diet no animal makes such a return in beef-production, but how quickly he wilts and perishes on a bush pasture in time of drought, when the less specialised breeds pull through in fair condition.

Again, the English racer has been specialised for speed, until many specimens are like greyhounds. On rich concentrated food he grows a good size; turned out to pick a living, his stock soon degenerate into weedy ponies. On the same pastures the stock of the Arab maintains his size, and possibly increases.

Breeding from highly specialised types of horses such as the greyhound racer, the London coach horse (specialised wholly for broadside show), the Shire (specialised solely for bulk), has ruined our horses.

Breeding from animals highly specialised for milk will as certainly deteriorate our cattle for general purposes, as did the highly specialised Shorthorn; his failure to improve our cattle may be questioned, but the facts go to maintain the assertion. There are few Shorthorn herds in Australia that their owners have not had recourse to Celtic strains, to endeavour in some measure to overcome the bad effects resulting from this specialisation.

There has never been presented to any generation since the dawn of history so many valuable object lessons in breeding and cross-breeding as are to be obtained in the Australia of to-day.

With intelligent observations, together with a collection of the facts, it would materially assist in enlightening future generations of Australian breeders, and, by making them more intelligent than we have been, enable them to rectify our blunders and profit by our mistakes by steering clear of them, thus adding to the general prosperity of the Commonwealth of Australia.

A NEW BACON-CURING PROCESS.

A NEW process of bacon-curing (says the *Australasian*) has been brought under the notice of the Minister for Agriculture in Victoria, named the "Auto-cure Process of Bacon-curing," which has been adopted by some of the large bacon factories of Sweden, and by Messrs. Oake, Woods, and Co., Gillingham, Dorsetshire, who have employed it for the last eighteen months in the production of Wiltshire bacon. The following description of the process is given by Mr. Down, the patentee of the new system of bacon-curing:—

The theory of the auto-cure system of bacon-curing is based on the fact that the gases present in fresh meat hasten the process of decomposition which sets in soon after death, and that exposure to the air of the curing-house before completion of cure entails a risk of contamination from germs which can scarcely be entirely banished even by the most perfect system of ventilation. All gases are therefore first extracted from the meat by means of vacuum, and thorough even and impregnation is subsequently effected by pressure before the sides have come in contact with the air. The process is effected by means of a cylinder, closed at one end, and fitted with a movable shield or door at the open end. This door has to stand a pressure of 120 lb. or 130 lb. to the square inch, equal to 700 tons on a surface 6 feet in diameter. The necessary resistance is obtained by acts of hydraulic rams, which hold the door in position.

The sides to be cured are placed on wooden trays which slide into iron frameworks fixed on trollies. These trollies are loaded outside the cylinder and run on rails which are continued inside the machine. The machines at present in

use vary from 25 feet to 35 feet long, so that 150 or 210 sides are cured at a time. The vacuum is formed either by steam injector or by an air pump, and the pressure is obtained by a force pump.

The sides to be cured are first injected with brine and pickle in the usual manner, and then placed on the trays. When full, the trollies are run into the cylinder, the door is placed in position, where it is held by the hydraulic rams. A vacuum is then formed, and the sides are left till all gases are extracted. On a valve connected with the bottom of the cylinder being opened, the vacuum draws up the brine from the tank below. When the cylinder is full, the valve is closed, and pressure is applied. The sides are left for a certain length of time, when the valve is opened to allow the brine to escape, and the process is complete.

As the process occupies only seven hours, the same machine can be charged twice a day. After the gases have been extracted, the tissues of the meat are ready to receive the brine, which the even pressure forces thoroughly and equally into all parts of the sides. By this process all the animal juices are retained in the meat, while under the old system of curing a certain percentage was lost when the sides were lying on the salt beds. The loss of these juices entails not only the loss of flavour, but loss of weight. With the auto-cure, when the brine flows away from the cylinder, it remains perfectly clear, and may be used again for months, the small loss by wastage and absorption by the meat being made up.

The cost of a 25-foot cylinder and all appliances for curing 150 sides at a time is £780. The new process will be used on a considerable scale in Canada and Denmark, and, if it proves all that is claimed for it, will create a revolution in the bacon trade.

"CAMENBERT," AN ARGENTINE CHEESE.

(Translated from the "*Boletin de la Union Industrial Argentina*.")

By HORACE EARLE.

THE difficulty of transportation of agricultural products is one of the many grave inconveniences which embarrass the agricultural industries of the South American States, and hence preference is given to those branches which represent the least volume and weight.

There is no doubt that in the mountainous regions where milk of the best quality is obtained, and at the lowest cost, the manufacture of cheese on a large scale is as profitable pecuniarily as it has become a necessity, from the character of the country.

The cheese which appears to offer the best advantages to the makers in these regions, and which we would recommend to the attention of those who look for the best return for their work, is the cheese known as the "Camenbert," which, with the well-known "Brie," is said to be the most highly appreciated in the market. It is generally the last and most luxurious item at table, and its high price results from the fact that the consumption has to be verified when it is in reason.

When not sufficiently cooled, the flavour of this cheese is insipid, and in the progress of its fermentation it turns moist and sour. When properly made, it is considered the most delicious of all cheeses. Its odour is a trifle strong, its substance is soft and delicate, and melts in the mouth without leaving an unpleasant piquant or buttery taste. Its flavour is sweet without being insipid.

In order that it may not become oily and insufficiently firm, it is advisable to first skim the milk, and the cream and fat thus removed will serve to make the celebrated and approved "Mantequillas Normandas," or Normandy butter-cakes. The milk that is skimmed thus in the afternoon should be mixed with

the unskimmed milk obtained next morning, and thus the best product will be obtained. The curds then distribute themselves in the liquid in cubes, which conserve the warmth. The rennet of commerce is then employed in the proportion of one spoonful of rennet to 50 litres (88 pints) of milk, at a temperature of 26 degrees to 27 degrees centigrade.

The quantity of rennet necessary is calculated so that the coagulation shall not occur in less than four hours, nor more than five hours, according to the season, the quality of the cows and their diet, and in order that when the cream separates there shall not result exact homogeneity in the product.

When the mass will not adhere to fingers, and completely separates itself from the whey, it is poured with a ladle into cylindrical moulds of tin plate, punctured with small holes to facilitate the exit of the whey. These cylinders, or moulds, measure 12 centimetres or $4\frac{3}{4}$ inches in diameter, and same in height, and stand upon rush mats or grooved tables. The moulds are filled gradually until they eventually contain the quantity of curd produced by two litres of milk—that is to say, the quantity necessary to form one cheese. During this process the temperature of the room should be maintained at 18 degrees centigrade. By the night or the following morning the cheese will have acquired sufficient consistency to permit of its being turned over, end for end; and, after two days, it will be in a condition to salt it, spreading the salt equally over both faces. When so far finished, the cheese will weigh about $\frac{3}{4}$ lb., and may be conveyed to the drying-room, where proper arrangements have been made for ventilation, and where the temperature can be maintained at about 15 degrees approximately. The windows in this room are small and numerous, and, are covered with fine metallic gauze in order to exclude birds and insects. The cheeses are arranged generally in rows upon spread-out straw, and do not touch each other. At first they are turned every day, and subsequently every third day. Little by little a pale-yellow mould will cover them.

The cheeses remain in the drying-room for twelve to twenty-four days, according to circumstances, until they have acquired a sufficient consistency and do not adhere to the fingers; otherwise, until they begin to sweat, when they are conveyed to a cellar, where they are perfected and acquire that peculiar softness of tone which is so appreciated by consumers. The cellar should always be kept at a moderate temperature and be somewhat damp, and so arranged that the rays of the sun may not enter it, and that the temperature may never exceed 14 degrees centigrade. The cheeses are placed on the shelves when completed in the order of their age, the damaged parts, if any, being carefully removed. The process altogether occupies about forty-five days generally, without taking into account those refining processes which some makers submit them to.

Cheeses of 300 grammes thus manufactured constitute a very profitable industry, requiring neither large capital nor much labour.

Poultry.

RAISING CHICKENS.

THE secret of raising chickens is to keep them growing all the time. To do this they should have nourishing food, a fair range, and not be overcrowded. Poor feed is expensive at any price where chickens are concerned. It is best to let chickens run at large, providing they do not go so far as to keep them tired all the time. A young chicken can be run down the same as the young of any kind, and when this is the case they will not prosper. They thrive unusually well in orchards, the reason being they are shaded, and insects are more plentiful. A piece of land where a fair amount of grass, old trees, and loose soil abound is the very best place imaginable to raise chickens, and especially after they have reached the age of four to six weeks old. Under the old leaves, and along the logs and fallen timber there is an abundance of insects, &c., which make splendid food, the shade is plentiful, and the green food contains the elements for building up the body. It is essential to give them all they can eat in the morning and evening, and if the range or run does not afford "good picking" it is best to scatter cracked grain where they can find it by scratching. A chicken that receives every attention and is pushed right along for the first few weeks must not be neglected, for if permitted to stop growing it will never fully recover.—*Adelaide Observer*.

KEEP YOUR FOWLS CLEAN.

THERE are many readers of a poultry column, as well as fanciers and others, who consider that too much is made of this subject. I confess that writers of the poultry columns are constantly harping on the subject, but it is in duty bound and in the best interests of those who keep poultry that this subject receives so much attention. I should not be far wrong in saying that 60 per cent. of the fowlhouses in the colony are so dirty that it is impossible for fowls to live in them in a healthy condition. Filth is the sure cause of disease, and oftentimes death; indeed, it is the one great curse in keeping poultry. If your fowls droop, or are ailing, see if the house is infected with lice or tick. If it is, so are the hens, and also are the nests. Do you think you would enjoy life yourself if a myriad of insects were for ever boring into your skin, preventing all comfort during the day and all rest at night? Yet this is the usual experience of the vast majority of fowls. They are overrun with lice or tick. Many of them have broken-down, draughty houses, fœtid runs, impure water, and then their owners wonder why they don't lay a plentiful supply of eggs. Cleanliness is second only to godliness in the human creature; in poultry-keeping there is nothing comes before it. It is the first and most important condition of success. It is advisable, therefore, to occasionally examine your birds for the purpose of detecting any parasites that may from time to time molest them. This remark also applies with regard to the houses. As the moulting season is fast drawing to an end, it is advisable to thoroughly lime-wash all poultry-houses, coops, &c., and if you have any suspicion that tick or other parasites are present use Little's Phenyle profusely in all the crevices, corners, and other places where these pests are likely to congregate. If this is neglected, the fowls which will in a very little time from now present quite a gay and glossy appearance will be found with their feathers eaten away to such an extent as to entirely spoil their appearance, and may eventually be found dead just for the want of proper attention.—*Adelaide Observer*.

POULTRY-HOUSES RULED OUT.

THE *Williamette Farmer* contains a lengthy epistle from the pen of Mr. George D. Goodhue, in the course of which he says :—" Perhaps friends will think that the poultry editor has stepped down from his high ladder when he asserts that a chicken-house is an abominable thing in a poultry yard, and a regular nuisance for at least nine months in the year. We confidently assert that there have been more fowls killed by lice in henhouses than there have been by coons and foxes in the whole Williamette Valley. Imagine, reader, our sixteen years fighting lice out of henhouses, and then having to come down to pure air of heaven, and a good fir-tree for our fowls to roost in. Imagine, further, our mechanical and cosy breeding-houses all torn down and used for other purposes, while a simple roost in the centre of each yard, about 2 feet high, and two boards tacked together against the fence and on the ground, forming a box for laying purposes, end our ornamental display of poultry fixtures. We prefer to keep a good collie dog and discard our henhouses, ornamented with lice and unhealthy chickens. We find our fowls all healthy, and they lay 50 per cent. better. Our chicks are raised with but little loss, and we have the satisfaction of knowing that our time is not spent in vain. We have not been killing 10,000,000,000 lice to-day, and get up and find 10,000,000,000 more at their funeral."—*Adelaide Observer*.

The Orchard.

STRAWBERRY-GROWING ON THE NORTH COAST.

By F. G. PIGUENIT.

SOIL.

THE strawberry does fairly well on various kinds of soil, such as light sandy loam on ridges, chocolate loam on the scrub land flats, and the heavy black soil overlying a subsoil of clay on the ridges and mountain tops.

On the low-lying lands some varieties of strawberries suffer very much from a leaf fungus, especially if the season is damp, as this dreaded fungus usually attacks the plant in the early spring, when the plant is weakened by bearing a crop of fruit.

When the plants are badly attacked the crop of fruit is considerably diminished; but on the tops of the ridges and mountains, where the atmosphere is not so humid, little or no leaf fungus appears, and in consequence a much more reliable and heavy crop of berries are gathered.

PREPARING THE SOIL.

The soil should be thoroughly broken up to a depth of 15 inches (18 inches not being too deep). The strawberry is a deep rooter, sending its roots down quite a foot and further; it also needs a great deal of moisture—the deeper the land is worked up, the better position it will be in to retain the moisture.

The land should be broken up some little time before the planting season. Where a plough is used, the best and cheapest way to break up is to double plough—*i.e.*, going twice in the same furrow.

Where this heavy work is done by hand it is always costly and laborious. After breaking up, let the land lie some weeks, for it to sweeten and fine down, also for any weed seeds near the surface to germinate. As the planting season approaches, plough or work the land (as the case may be) to the depth of 6 or 8 inches; harrow and roll down fine; be sure that there are not any clods, as a fine seed bed ensures success with the young plants taking root. When the crop is cultivated entirely by hand, if the season is dry, it is a good plan to mulch the ground before planting, and plant out in the mulch.

With the picking season the grower's very busy time commences. The birds alone require a great deal of watching, more especially if the surrounding timber is close. They are always more troublesome in the early season, when the grower can ill afford to lose any of his berries. The "Chalwong" (a pied shrike) will actually wait in the surrounding timber and watch the berries ripen, and, if not looked after very closely, will have the berry in spite of the grower.

WORKING.

About a week after planting go carefully through the rows with the horse-hoe set *shallow* (so as not to disturb the young roots). This will let the air into the soil, besides destroying any young weeds that may have come up, but the ground around the plants will require working by hand. The plants should be worked at least once a fortnight. For the first month or two after planting, when the plants begin to show the blossom buds, they should be mulched with some clean grass or straw. The mulching keeps the ground cool and damp around the roots of the plants, besides keeping the fruit clear of grit.

In horse culture I find it only advisable to mulch around the plant, leaving the centre of the rows bare, which can be kept cultivated. The Planet Junior machine hoe is a splendid tool for the work.

PLANTING.

This should be commenced in February, and can be continued right through the month of March for the varieties that produce the early strawberries, but for the later kinds the planting season can be extended until about the first week in May. For working with the horse the rows should be from 32 inches to 36 inches apart, and the plants from 14 inches to 16 inches in the row. But when all hand labour is used the distance between the rows may be lessened, but it is not advisable to put the plants closer in the rows. Try and do the planting when the weather is showery; then the plants will not require any watering. If the weather is dry, only plant in the evening when the sun is low, and water all; one pint of water will be sufficient for each plant. As soon as the water has soaked away, break the surface that is wet around the plant to stop evaporation. If the weather continues dry, water every second day for the first week, then one good watering weekly until the plant is rooted. When lifting the plants try and have a ball of earth adhering to the roots, which will help the rooting considerably. Also take care that the plants when lifted are not exposed to the sun and wind. A good plan is to keep them covered with a wet bag until they are planted out. In planting do not plant too deep, and take care to spread the roots well out. Let the plant just show the crown peeping above ground. In about four to six weeks after planting, the plants will begin to throw out runners. These must be kept pulled off as they appear, otherwise the plant will be weakened, and will not bear such a heavy crop of berries.

PICKING AND PACKING.

As soon as the berries begin to change colour (which will be about the end of July and beginning of August, according to situation) they should be picked, as they ripen very fast as the sun's heat increases. They are usually picked into plates or small flat trays, then carried to the packing-shed, where they are packed into shallow trays or boxes of pine (generally split in the vicinity). It is best to grade the berries according to size and quality, making three grades—viz., A1, first, and second quality. For carrying safely, the berries should be packed only one tier deep, and the trays should not hold more than four or five quarts each. Women make much better packers than men; their fingers being much lighter, they are not so liable to damage the fruit. After the first three or four weeks, if the berries are plentiful, it is as well to leave off making the second-quality grade, as the price obtained for this grade will scarcely pay for the extra work in packing them. They can then be put into the jam cask with the small berries, all the nibs being first taken off.

At present there is a steady sale at the Brisbane jam factories for all the jam strawberries that can be produced.

VARIETIES.

Of all the varieties that have been tried on the North Coast the "Marguerite" comes out a long way ahead of the other kinds, but to do its best it requires high land. "Pink's Prolific" is a splendid late strawberry, and does well on the low rich scrub lands, being quite free from the leaf fungus. "Captain" is a strawberry of great promise, but has not been grown long enough to establish its merits. "Arthur" is a splendid strawberry, a second edition of the "Marguerite," being quite as large, rather better coloured, and much firmer, but the Queensland sun is too much for it, as it dies right out. The following varieties have been tried with very poor success:—Edith Christy, Trollope's Victoria, Red Chilian, Myatt's Surprise, Bidwell, Lee's Prolific, King of the Earlies, Pioneer, and Countess.

Growing strawberries on the North Coast is not a pastime, this crop requiring more labour and attention than any other, the grower's time being taken up during the whole of the year—*i.e.*, if he grows a large patch of, say, three or four acres. In a district where the rainfall is heavy the weed growth is tremendous, and the strawberry will not stand choking with weeds or any neglect.

Viticulture.

PRUNING.

By E. H. RAINFORD,
Viticultural Expert.

THE necessity of a correct system of pruning is one of the first considerations in Viticulture; it is one of the points upon which hang the success of the vineyard, the quality of the wine produced, and the welfare of the vigneron. Incorrect pruning carries with it a double effect—firstly, upon the quantity and quality of the grapes afterwards produced, and, secondly, the value of the wine made from them. In other fruit trees an incorrect system of pruning will give a small crop or an inferior quality of fruit, but there the matter ends. Not so with grapes if intended for wine-making; an inferior grape, which for table purposes would have found a market at a depreciated value, will, when turned into wine, make a beverage which will require the addition of sugar and fortifying to keep sound and be drinkable, or else it will prove unsaleable. A vine pruned on rational principles should produce grapes with sufficient saccharine matter to make a wine that can be drunk pure and unfortified.

A correct system of pruning, again, has a considerable influence on the prevention of fungus attacks, inasmuch as an insufficiently pruned vine, with a superabundance of weakly shoots and bunches, falls an easy prey to disease. There is no denying that many vignerons in the colony have given far too little attention to this most important part of the cultivation of the vine, and undoubtedly a good deal of the disease affecting vines may be traced to it. It is true enough that our climate is answerable for a great deal, but, knowing that, it should be the aim of the vigneron to keep his vines in as vigorous and healthy a condition as possible, to be able to resist fungus attacks, and this can only be attained by a proper system of pruning. Some people seem to think that a vine can be left almost to itself—at any rate, with but a small amount of pruning—being deceived, no doubt, by the growth and vigour displayed by the young vine for the first few years of its life. But what is the result? For a year or two there are huge crops; the vigour of the plant making supreme efforts to carry the grapes, but later on strength fails, and stunted shoots, weakly small bunches, diseased and rotting, tell a tale of exhaustion and decline. It would have been far better for him had he contented himself with moderate crops at first, as they would have continued year after year, and he would not have had the pain of seeing his vines sickly and exhausted. It is the old story of killing the goose, &c. If a man will from the first prune his vines systematically and content himself with a reasonable crop, his vineyard will live to a good old age, but if his greed tempts him to impoverish his vines in their youth by insufficient pruning they will have a short life.

TIME FOR PRUNING.

The vine should not be pruned before the new wood has well summered and the sap has ceased to flow—two points of easy ascertainment; they should not be pruned after the sap has begun to move in the spring, unless for a special purpose. One purpose to be attained by doing so is to prevent injury by frost to young shoots of early-sprouting varieties, in districts where late frosts are to be apprehended. By pruning the vine when the sap is on the move, and the eyes are beginning to swell, the expansion is checked by as much as a fortnight in some cases, and injury by late frosts avoided. Some are of opinion that late pruning does not harm the vine. It is true that in many

cases no ill-effects are noticeable either in the fruit or shoots; but that the loss by bleeding at the pruning sections can be anything but harmful is the writer's firm conviction. From May to the end of July the vine can be pruned without danger, according to district and climate.

MANNER OF PRUNING.

Some writers advocate cutting the canes across the knot above the bud left for vegetation. They argue that unless cut in this way moisture may accumulate inside the severed cane, and cause rot and injury to the bud below. In this colony such a danger is not to be feared with the limited winter rainfall, and in long-noded varieties of vines this method of pruning would leave an unsightly amount of long dead wood, which would cause injury to shoots and bunches in windy weather; an inch from the bud will be long enough. When pruning away suckers and canes not required for new spurs, always cut away as close to the stock as possible. The cut will heal better, and there will be less sprouting of fresh suckers at that point. Always cut away any dead wood from last season close to the green wood to avoid wood-rot.

THE OBJECT OF PRUNING.

The object of pruning a vine is (to put it as succinctly as possible) to get as much fruit off it as possible without impairing its health and vigour. To do this, a balance must be maintained between the crop taken from the vine and its producing power. If you allow too many bunches to be developed the vigour is diminished, and the bad effects will show later on; if too small a crop is allowed to develop, the vigneron has a loss, and a superabundance of wood is made. On the fertility of the soil, the climate, and other physical conditions will depend the amount of crop to be grown—the vine itself will tell you how much.

The art of the pruner consists in directing and managing the vigour of the vine, and getting the most benefit from it; in other words, a maximum of fruit instead of a maximum of wood and leaves.

A few of the laws which govern this art may be given here for the guidance of the pruner:—

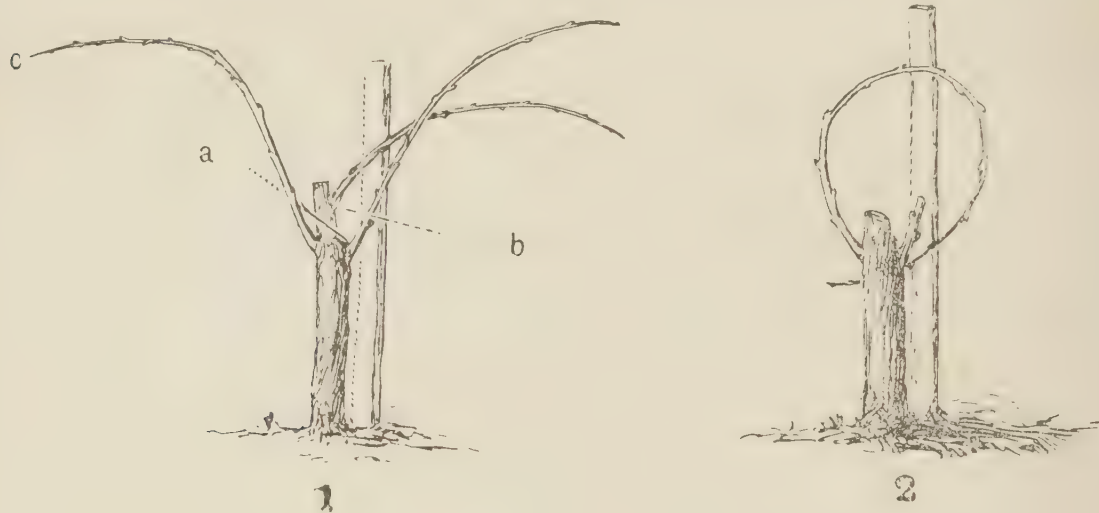
1. If the vigour of a vine is diminished, its production of fruit is increased up to a certain point.
2. A cane will produce more fruit the more it departs from a vertical position.
3. The vine shows most vigour at the points furthest from the stock.
4. The greater the number of shoots, the weaker they will be individually and conversely; the fewer the shoots, the greater the vigour of each.
5. The more abundant the fruit, the less the saccharine matter in it.

There are many ways of pruning, each of which has its admirers and advocates, but they are all variations of two systems—long and short pruning. Long pruning consists in leaving a cane with six or more eyes for the production of fruit and called the fruit-branch, and a spur pruned to two eyes for the production of wood.

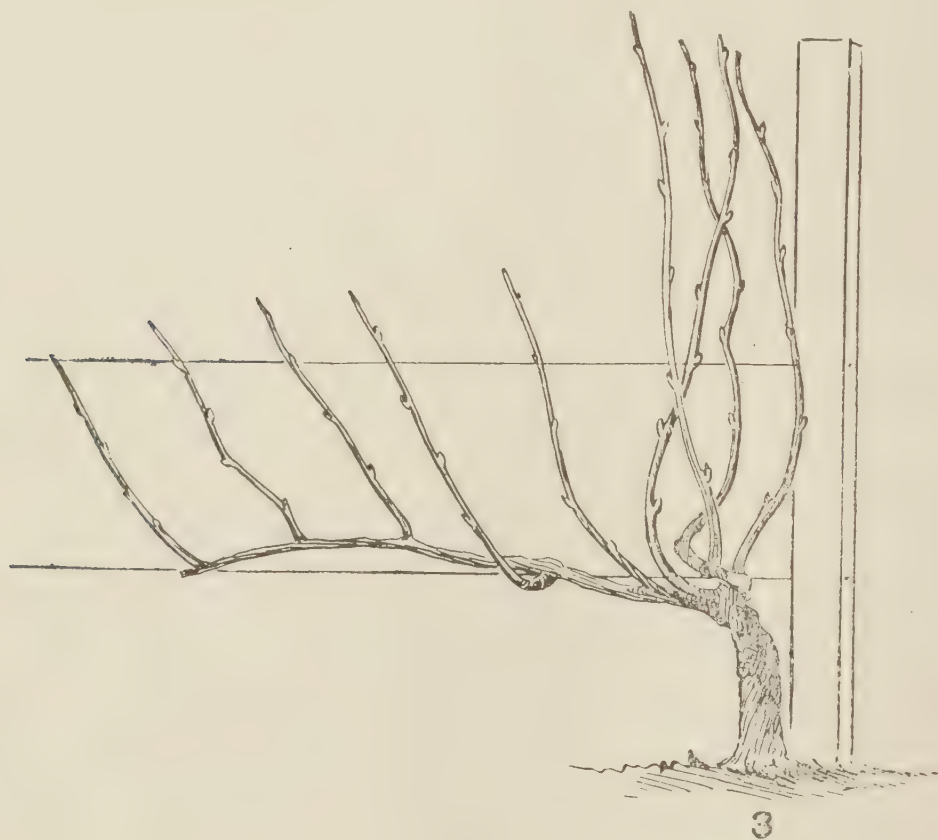
Short pruning consists in leaving several short spurs with two or three eyes each for the production of wood and fruit, the number of spurs depending on the age and vigour of the vine. But it may be asked, Why should a vigneron bother about long pruning with its fruit-branch and wood-spur, when it is so much easier to cut all the canes down to two eyes, and have done with it? The reason is because in certain varieties of vines the eyes of a cane nearest the stock are frequently sterile, so that by short pruning only the sterile part would be left to vegetate, whereas the buds further away from the stock contain the embryos of a more numerous and finer quality of bunches. It is necessary, therefore, before pruning, to be sure which method is most suitable to your vines. The reasons for having two systems being explained, the mode of procedure in long pruning will be taken first.

LONG PRUNING.

Until a vine is two years old, it should be pruned to one spur with two or three eyes. In some Queensland soils, where the young vine shows great vigour and vegetation, three eyes should be left to carry off the sap; the third year the plant will be as represented by Fig. 1. To initiate long pruning, the upper cane should be removed, as shown by the dotted line A, and the lowest

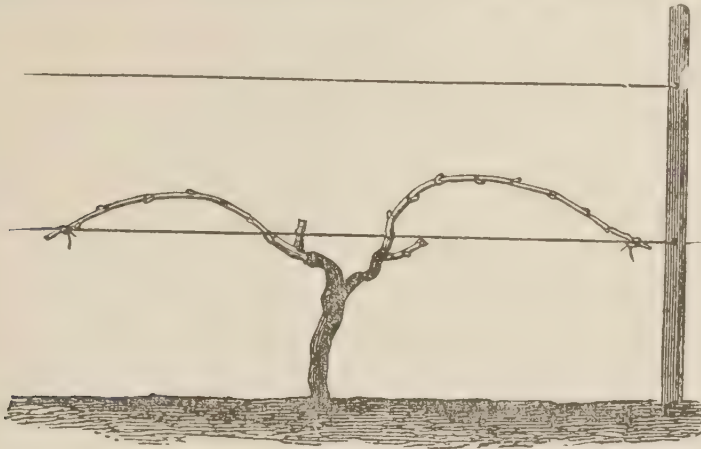


shortened to two eyes at B, to form the wood-spur; the fruit-branch C is left with six eyes and arched down to the wire or to the stake, as in Fig. 2. The following season the vine will present the appearance of Fig. 3; if it is trained

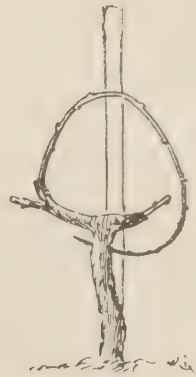


on wire, the whole of the branch that bore fruit must be pruned away close to the stock and two of the best canes from the wood-spur chosen—one to be arched down for fruit-bearing, as before, and the other pruned to two eyes for next season's wood. Once the vine has been started on this system the pruning is easily understood and quickly accomplished, but to bring vines that have been improperly pruned under this system will require judgment and loss of time. In a year or two, if the soil is fertile, and the young vine shows vigour, the

system may be doubled, as at Fig. 4; it will be well to keep one or two adventitious shoots pruned to two eyes, as at Fig. 5, to be enabled to double



4



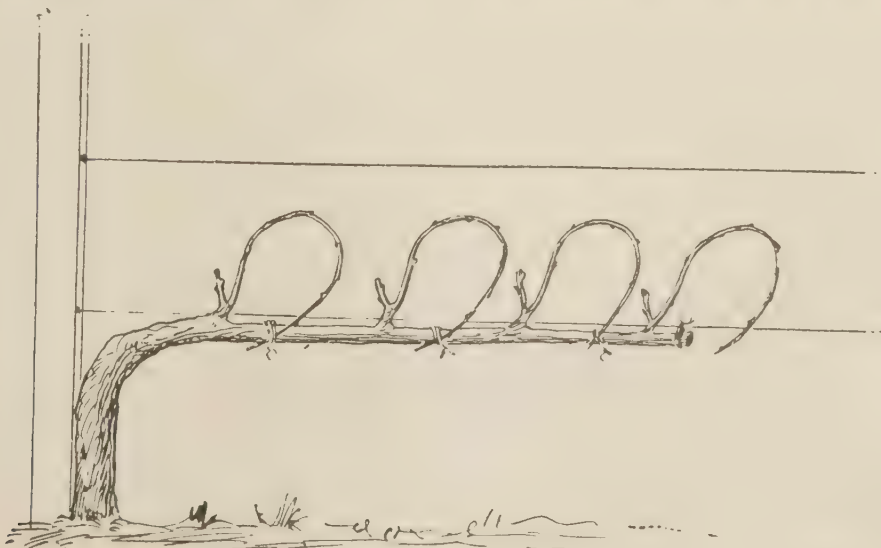
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the system at any time or to replace canes damaged by wind or accidents. The method of pruning just described is called the single and double Guyot or single and double rod-pruning. The Quarante system is a double Guyot with the fruit-branches crossed, as at Fig. 6. In Europe, where vines are



6

planted much closer than in Australia, this method is adopted because it takes up less room than the double Guyot. When the soil is very rich and fertile,



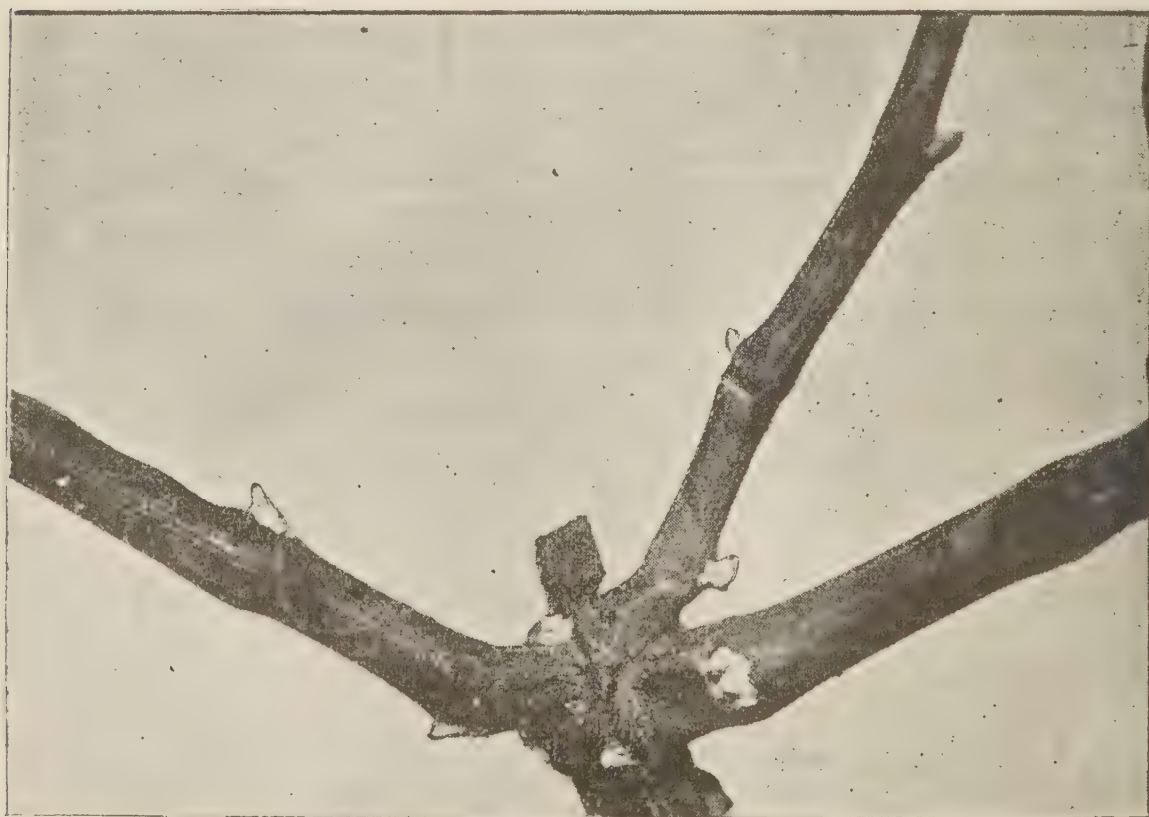
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and the vine shows great vigour, the long-rod system may be still further developed, as in Fig. 7, where it is quadrupled and called the Cazenave, but some management would be necessary to provide the elongated stock on which the spurs are developed.

The vigneron will ask, "But how am I to know whether a vine is too much pruned or not pruned enough—whether it is vigorous enough to bear the double or quadruple Guyot systems?" The answer is, If the vine is pruned too much the canes will be long, thick, and probably branched, bearing little fruit. If the vine is pruned too long, the shoots will be weak and stunted. It is a thermometer there is no mistaking. So long as the spurs for wood continue to produce canes sufficiently long for next year's fruit-branch, the vigneron may continue to lengthen the pruning of the fruit-branch; but when the canes begin to weaken and shorten, he must shorten his fruit-branch. He has only to keep his eye on the canes for next year's fruit-branch to have an infallible guide to prune by. These canes should not be less than from $3\frac{1}{2}$ feet to 4 feet in length. Be careful in pruning to leave the fruit-branch above the spur for wood and not *vice versa*, or the stock will increase in length too rapidly. It will be well also to pinch off the first two buds of the fruit-branch when they invariably prove sterile, but not otherwise.

SHORT PRUNING.

As before mentioned, short pruning is adapted for certain varieties of vines that have all the buds on the canes equally fertile. Short pruning in this case causes no loss to the vigneron, and the vineyard can be cultivated without training the vine on wires. The vine in its third year, as shown in Fig. 1, is pruned to two spurs, B being cut away as for long pruning, and A and C shortened to two eyes each. Next year instead of two spurs three may be left of two eyes each, always choosing a shoot to form the spur, as near the stock as possible, as in Fig. 8. The following season another spur can be



developed, as in Fig. 9, choosing as before a cane for forming the spur as near



9

the crown as possible. It may not be possible always to get new canes so propitiously placed as in Figs. 8 and 9, but they are reproduced from Professor Perkins's work to show the vigneron the shape he should give his young vine ; and if he cannot attain such symmetry, he must get as near it as possible. If no cane from the crown offers for forming a spur, choose a cane from an older spur, as at A in Fig. 10.



10

This system of short pruning is called the bush, goblet, or fan, according to the position given to the spurs.

A variation of short pruning where wires are used is the horizontal cordon or Royat system, as in Fig. 11. Here the spurs are distributed along the stock,



11

bent at right angles along the wire, and should be equal in number to those in the goblet form. A double horizontal cordon has two arms, one on either side of the stock, with spurs at intervals. In France the horizontal cordon system is denounced by some writers on the ground that the exaggeration of the stock entails a decrepitude of the vine and affords more cover for noxious insects, but there is no doubt that with many it is an attractive form of pruning. This system should not be adopted where, from poverty of soil or dryness of climate, the vegetation of the vine is feeble and insufficient to impede work in the vineyard if pruned goblet fashion.

The same rule applies to short pruning as to long with regard to the number of spurs and eyes to be left on each. Watch your vegetation, and if the growth continues vigorous increase the number of spurs and eyes. As a rule, eight spurs is a maximum for a goblet-shaped vine; if more than that number are formed, there will be crowding and insufficient aerification. If the vigour of the vine is such that eight spurs of two eyes each are insufficient to carry off the sap, prune some of the spurs to three eyes, being careful to cut back again next pruning.

One of the great mistakes many of the Queensland vignerons have made is when a spur has been left with two or three eyes, each forming a cane in the following season, instead of cutting back to one spur with three eyes, they have pruned *each cane* to two or three eyes, so that every year the spurs are doubled in number until the vineyard becomes a kind of Isis Scrub. No vine in the world can bear such a system of pruning without having its vigour and bearing power seriously weakened.

Appended is a list of some of the vines more commonly met with in Queensland under the headings of short, long, and both ways of pruning. For vines not mentioned in this list, it may be taken as a general rule that, if the shoots are erect or semi-erect, short pruning is indicated; when spreading or falling over to the ground, long pruning is required. Most table varieties are better for long pruning:—

Short.	Long.	Short or Long.
Oeillade Alicante or Grenache Carignan Mataro or Esparte Doradillo	Carbenet Muscats Jacquez or Lenoir Zante Riesling Verdeilho	Isabella Wilder and other Americans Black Hamburg Black Prince Pinot or Black Cluster Shiraz (better long) Chasselas or Sweetwater

HINTS TO PRUNERS.

As in many vineyards in Queensland the vines have been improperly and insufficiently pruned from the first, it would not prove an easy matter to bring them back into shape and condition according to one or other of the systems above described, but a few words of advice how to set about it will not be out of place. To begin with, do not attempt to prune a vine that has been allowed too many spurs straight away to its proper number; if that were done, the vine would probably die. The reformation must be gradual and spread over two or three years. Start by deciding on the system to be adopted in the future, such as the Goblet, Royat, or double Royat, for short pruning and the single or double Guyot, &c., for long pruning according to whether the stocks have been kept short or allowed to elongate.

With an eye to the future shape of the vine, begin to cut away from a third to one-half of the spurs close to the stock, pruning off always the oldest and most scarred and distorted wood, leaving the youngest. Do not hesitate to cut away diseased wood and leave clean young wood, if only last year's growth from the stock, as, although it will probably not bear grapes the first season, it will make a far healthier spur and give more fruit subsequently. The second year the same process is continued until the correct number of spurs adapted to the vigours of the vine is reached for short pruning, or the requisite wood-spurs and fruit-branches left for the long-pruned vines. In short, cut out old, diseased, and extraneous wood, leaving young wood at the proper intervals and positions for spurs or fruit-branches.

Should any vigneron find it difficult and confusing in taking the first step towards bringing his vineyard into correct and systematic pruning, the writer will be happy to give any assistance in his power either with advice or practical demonstration.

Adopt uniformity of pruning in vines of a class, although it may entail some trouble at first to bring the vines to shape; if some are pruned one way and some another, there will be confusion and loss of time each pruning.

Do not attempt to train your vine both high and low, as, according to law 2, the vigour of the vine will be directed to the upper branches, and the lower spurs will languish. Either train the vine exclusively high or exclusively low.

The mournful object depicted at Fig. 12, Plate XXXVI., is a typical vine, badly pruned, to be met with in many Queensland vineyards. A more distressing example of floral poverty and wretchedness could hardly be found. Instead of keeping a single and undivided stock up to a certain point, the vigneron has, when the vine was two years old, permitted all the buds to develop long wood, with the result that now there are three stocks instead of one wandering promiscuously about at their sweet will. More than twenty-five spurs have been left to vegetate last season instead of six or eight; most of the shoots are from 18 inches to 2 feet long, and the base of the spurs a mass of dead wood interfering with the circulation of the sap.

To bring this vine into proper shape and condition is an impossibility, but, with a view to giving inexperienced vignerons some idea of the treatment for similar cases to improve its condition and give it a more rational shape, the same vine is shown pruned at Fig. 13, Plate XXXVI.

A in Fig. 12, Plate XXXVI., has been cut away altogether, as there was hardly any life in it, and B, the only strong shoot on the vine, laid down in its place; C has been cleaned of dead spurs, &c., and pruned to three spurs of three eyes each; D has been shortened, as the upper part was dead or dying, and pruned to four spurs of two and three eyes each; E has been shortened, as it straggled into the next vine, and pruned to one spur of three eyes; no other wood offering, the whole assuming the appearance of Fig. 13, Plate XXXVI.

It has been mentioned above that the badly pruned vine should not be reduced to its correct dimensions all at once, as it would probably be injured or killed by doing so; for this reason some branches have been left that will have to go next season—for instance, C in Fig. 13, Plate XXXVI., will be cut away close to the stock; B raised a little, and every alternate shoot from this year's growth suppressed and the remainder pruned to two eyes, forming a permanent horizontal cordon with four spurs. To form a similar cordon on the right-hand side will depend on the season's growth of wood; if E develops shoots in position for forming spurs, then D should be suppressed at the stock; if, instead, D develops spur-making wood, which is the more likely, then E would be suppressed at the stock, shortening D at F.

It must be understood that the vine can, under no circumstances, be reduced to a symmetrical shape, but it will be far healthier and more vigorous than it is at present, and stand a chance of living for years. A vineyard left in the condition as shown by Fig. 12, Plate XXXVI., is doomed to an early death.

NOTE.

Should any of our vignerons desire practical assistance in pruning their vines this year, they are requested to communicate the fact to the local Agricultural and Horticultural Society secretary, and, if a sufficient number of applications have been made, the Viticultural Expert will visit the district at pruning-time.



Fig. 12.—Showing Improperly Pruned Vine.



Fig. 13.—Showing First Stage of Improvement.

Botany.

EDIBLE FRUITS INDIGENOUS TO QUEENSLAND.

(To be continued as fruits become available.)

BY F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

No. 1.

DAVIDSONIAN PLUM.

(*Davidsonia pruriens*, F. v. M.)

THIS forms a small tree of graceful erect habit, and belongs to the order Saxifrageæ. Leaves often long, drooping, leaflets oblong-lanceolate in opposite distant pairs with a terminal odd one, stalkless, clothed with short hairs, margins sharply toothed, rhachis between the leaflets bordered by interrupted jagged wings between the leaflets, lower leaflets the smallest, the upper ones often over 7 in. long. It is a native of tropical Queensland and bears its oval fruit, which attains the size of a goose-egg, on long pendulous racemous panicles. The outside of the fruit is covered with short stiff hairs; these, however, are easily removed by a slight rubbing with a rough cloth, and then is exposed the smooth purple plum-like skin of the fruit; the interior is composed of a few flat, irregularly-shaped seeds, embedded in a soft fleshy pulp of a rich purple colour and a sharply acid flavour. (See Plate XXXVII.) The seeds are small for the size of the fruit, a feature not frequently occurring in wild fruits, but not uncommon in tropical Queensland. This plum, which is in perfection about July, is largely used by the settlers for making into jam and jelly, as well as an addition to pie-melon or pumpkin, to which it imparts an agreeable acid and rich colouring. By careful selection and cultivation this fruit might become a valuable addition to our cultivated kinds.

For many years past this tree has borne fruit in plantations in Southern Queensland, particularly in the garden of the late Mr. A. J. Hockings, South Brisbane. These fruits only attain about half the size of those in the Northern scrubs, although for flavour and colour they quite equal the tropical fruits.

A smaller form of this fruit, *D. pruriens*, var. *Jerseyana*, is met with in the scrubs of Southern Queensland and the adjoining scrubs of New South Wales.

No. 2.

ENDEAVOUR RIVER PEAR.

(*Eugenia eucalyptoides*, F. v. M.)

THIS is a tall shrub or small tree with pendulous branches. Leaves on the Queensland plants linear-lanceolate, falcate, 4 to 7 in. long, tapering to a fine point, and at the base to a slender petiole of about 5 lines, width 2 or 5 lines, penninerved with oblique distant nerves joining an intramarginal one near the edge of the leaf, both surfaces closely covered with minute dots. I have seen no flowers of the Queensland form. The fruit is rosy-red next the sun, pear-shaped, about $1\frac{3}{4}$ in. long, and $1\frac{1}{2}$ in. in diameter at the larger end,

and usually containing a single round seed. The flesh of this fruit is white, delicately flavoured, and abundant, and used by the settlers for jam-making. The fruit now figured (*see* Plate XXXVII.) is off a tree in Mr. Hockings's garden, South Brisbane. Besides the present there are amongst the indigenous species of this genus 9 or 10 others which are equally suitable for the purpose of jam-making, and from one if not more a fair wine has been made, but, like the roseapple and the Brazilian cherry, cannot be recommended for planting on a large scale by the fruit-grower.

EXPLANATION OF PLATES.

1. Foliage and Fruit of Endeavour River Pear (*Eugenia eucalyptoides*).
- 1A. Section of Pear.
2. Foliage and Fruit of Davidsonian Plum (*Davidsonia pruriens*).
- 2A. Section of Plum.
- 2B. Seed.



1. ENDEAVOUR RIVER PEAR

2. DAVIDSONIAN PLUM.



DAL OR PIGEON PEA CROP AT THE AGRICULTURAL COLLEGE.



STUDENTS CUTTING DÂL OR PIGEON PEA.



DÂL OR PIGEON PEA.

Economic Botany.

No. 7.

PIGEON PEA, OR DAL (*CAJANUS INDICUS*, Spreng.).

By J. F. BAILEY.

Derivation.—The generic name is derived from *catjang*, the Amboyna name.

Description.—An erect leguminous shrub with slender, furrowed, grey-silky branchlets. Leaves 3-foliate. Leaflets 3, thinly silky above, densely beneath. Flowers yellow, or sometimes veined with red. Pods 2-3 inches long, and $\frac{1}{4}$ -inch to $\frac{1}{2}$ -inch broad, finely downy.

Cultivation, Uses, &c.—Though a perennial, Dal is treated as an annual in India, because it does not produce a good second year's crop, and because the wood is so useful for fuel. It is also the best wood for procuring fire by friction. The charcoal made from it is in esteem for gunpowder.

Dal is one of the most widely diffused and valuable of tropical pulses, being considered in India as next in rank to the Chick Pea (*Cicer arietinum*), and is in use amongst all classes of natives as a nutritious esculent (Bot. Mag.). The seeds are chiefly eaten mixed with rice, a mess known as *kedjari*. Drury states that they are apt to produce costiveness. Horses and cattle are very fond of the young branches and leaves, either in a fresh or dried state.

In this issue of the *Journal* are reproduced two excellent illustrations of this crop as it appears growing at the Queensland Agricultural College. Mr. A. J. Boyd states that "about an acre was sown there as an experiment, and has turned out most satisfactorily, both as regards weight of fodder and value as feed for stock, the dairy cattle being especially fond of it. It was sown in rows about 6 feet apart and 4 feet between the plants, and grew without a check to a height of over 8 feet before commencing to flower. It branches as profusely as the *Hibiscus* family, and produces a very considerable amount of soft-leaf fodder. This has now been cut and chaffed for the silo. The thick stems and harder portions of the branches are left in the field, as they would be useless as cattle feed. Amongst other good points of the pigeon pea is its usefulness as a destroyer of weeds. Similar in growth to a dense scrub, the soil beneath it is perfectly free from weed growth of any kind. It might consequently be of value as a destroyer of nut-grass, owing to the dense shade it produces, and it would be worth while to make a trial of it with this view. As to the weight of fodder per acre no information is available at present, but judging from the appearance of the crop it must be very considerable."

EXPLANATION OF PLATE.

- FIG. 1. Wing.
 „ 2 and 3. Keel.
 „ 4. Stamens.
 „ 5. Valve of Pod.
 „ 6. Side and hilum aspect of Seed

All enlarged from *Botanical Magazine*.

Horticulture.

NOTES ON SCENT-YIELDING PLANTS.

By "NAT SINE."

THE following preliminary notes on scent-farming in Queensland have been kindly furnished to the *Journal* by a gentleman who is engaged in the industry in the Southern part of the colony:—

In a future issue we shall publish "Nat's" personal experience in scent-farming.

The following notes on scent plants have been written with the hope that they may prove of some slight use to anyone thinking of starting scent-farming in Queensland.

To settlers on the rich scrub lands of our Southern coastal ranges, where cost of carriage precludes the possibility of ordinary heavy crops being profitably produced, the perfume industry particularly recommends itself, on account of the smallness in bulk of its products when compared value for value with other produce.

The following notes include the names of such plants only as are likely to grow to perfection on the high lands of Southern Queensland.

For convenience' sake the names of plants are given in alphabetical order, the first on the list being:—

ACACIA FARNESIANA.—This plant, better known as Cassie, is grown extensively in the South of France, where it thrives better than anywhere else in Europe. It also grows well in the vicinity of Brisbane, and may even be found growing as far north as the valley of the Flinders River, above Hughenden, where its flowers shed a perfume of intense sweetness.

The young trees are generally raised from seed in prepared beds, and when about 2 or 3 feet in height are transplanted at distances of about 12 feet each way into well-worked land.

The flowers come to maturity in succession along the branches, which is of great advantage to the grower, one lot of blossoms being disposed of before the others are fit to gather.

The perfume is procured by successive maceration of the fresh flowers in purified fat, kept in a liquid condition by gentle heat. After standing for from twelve to forty-eight hours, the spent blossoms are strained from the fat, to which fresh are added. This process is repeated ten or fifteen times, till the required strength of perfume is obtained.

In France matured trees yield flowers to the value of from £30 to £40 per acre. The perfumed fat would probably find a ready sale at about 12s. per lb.

BERGAMOT.—This useful perfume is obtained from the rind of the fruit of *Citrus bergamia*, either by expression or distillation, and is so much in demand that the production falls very short of requirements. It is in consequence largely adulterated.

One thousand fruit will yield about 30 oz. of oil, which when pure is worth from £1 10s. to £2 per lb.

This oil is produced near Palermo, in Sicily, and is worthy of the attention of orange-growers in Queensland.

The tree requires much the same treatment as the orange, and is generally planted about 12 feet each way.

CEDRAT (*Citrus medica*).—This highly-scented oil is obtained from the rind of the ordinary citron, both by expression and distillation, and its delightful lemony odour procures it many admirers. It is not much used for scenting soaps, being too costly for that purpose, but it enters largely into the composition of handkerchief perfumes.

As the citron yields a quantity of oil, it should be worth the attention of growers, especially as the oil brings in the market about 18s. per lb.

A very fragrant oil is also obtained from citron flowers by distillation, which is much used in perfumery.

FLAG (SWEET).—The bulbs of this plant yield on distillation with water a very sweet-smelling oil, which is largely used for scenting soaps, &c. One hundredweight of bulbs will give a return of about 1 lb. of oil.

FRANGIPANNI (*Plumeria alba*).—This plant is well known in Queensland, and thrives in the Southern parts of the colony, where it produces flowers of fine perfume in great abundance.

The perfume known as Frangipanni is distilled from the flowers of this plant, and is a general favourite. It may also be obtained from the flowers by maceration in liquid fat, being afterwards extracted by infusion in rectified spirits. It may possibly be isolated from the spirit by distillation at a low temperature; the spirit distilling over and leaving the otto behind, as their respective degrees of volatility are widely different.

Frangipanni is a very dense perfume, occupying a position on the scale of odours between clove and patchouli.

GERANIUM (*Pelargonium capitatum*).—This plant, known also as roseleaf geranium, is grown extensively in France, Spain, Turkey, and Algeria, and yields on distillation with water a delightful rose-smelling oil. It is largely used in the adulteration of otto of roses, and in some places is especially grown for that purpose.

In sound scent-farming the rose and geranium should always be grown together, as the refuse distillate of the former, if used over geranium, considerably adds to the value of the otto obtained from that plant.

This plant might be profitably cultivated in Queensland, as most of the geraniums seem to be quite at home in the colony.

In raising plants the usual method is to propagate from cuttings, which soon grow into fine bushes. The whole plant is reaped for distillation, being cut close to the ground. The bushes grow to a height of 3 or 4 feet, 100 cwt. of plant returning about 2 oz. of oil, worth, when pure, 4s. per oz.

From 3,000 to 4,000 plants go to the acre, one planting generally lasting for about four years. In Algeria three cuttings are obtained from the plants in one season.

JASMINE (*Grandiflora*).—The perfume obtained from the jasmine by absorption on clarified fat is one of the most prized by the perfumer, on account of its sweet and delicate odour and the impossibility of imitating it.

The otto or essential oil of jasmine may be obtained by repeatedly using the waters of distillation over fresh flowers. This otto is very costly—worth about £9 per fluid ounce—and is seldom seen in the market.

In France the fresh jasmine flowers are worth from 1s. 6d. to 2s. 6d. per kilo.

About 8,000 plants go to the acre, which will yield about 5 cwt. of blossoms, which in turn will perfume about 1½ cwt. of fat, valued at about 12s. per lb.

LAVENDER (*Lavandula vera* and *L. spica*).—There are several kinds of lavender, but only two (the *L. vera* and *L. spica*) are cultivated to any extent in England and France. The English lavender is said to be very superior to the French, and is generally worth about eight times as much.

About 4,000 to 5,000 plants go to the acre, according to spacing, which is more or less a matter of opinion. Generally speaking, the plants are not placed closer than 3 feet each way.

Plants should be raised from cuttings, not from seed, and should not be allowed to flower too soon.

Lavender likes a temperate climate and a sunny situation, also a deep, loamy, friable soil. Cuttings may be struck from, say, March to August or September in the Southern parts of the colony, under favourable conditions.

Rooted plants may be transplanted as late as August, and will probably come into bloom by the end of November.

Lavandula vera, the only kind worth cultivating, is very difficult to procure in Queensland.

One hundredweight of lavender will return about 2 lb. weight of oil, but the quantity of this, as of all essential oils, will fluctuate with the seasons.

The returns per acre are very hard to arrive at, opinions on the subject differing to a great extent.

It has been stated that an acre of lavender will return about 50 lb. of oil, valued at anything from 20s. to 60s. per lb. This seems rather too much, but there is no doubt it is a profitable crop, provided it can be produced free from camphor.

Lavender is distilled in the ordinary way with water. The process is simple enough, and merely requires care, a little watchfulness, and the exercise of common sense.

To increase the size of the flowers and generally improve the appearance of the plant, superphosphate of lime is often used with good effect.

PANSIES.

Now is the season for planting out pansies. What can be more beautiful than a bed of well-selected, well-cultivated pansies, or, as we used to call them in the old country, "Heartsease." Much money is made out of pansy-growing in the European countries and in the United States of America, and principally by women and children. The work is anything but laborious, and the result of careful cultivation is as pleasing to the eye as it is profitable to the pocket. If your garden happens to be situated near scrubs or forests where leaf-mould can be obtained, make a mixture in the proportion of one-half leaf mould, one-quarter of old well-sifted manure, one-eighth wood-ashes or soot, and the last eighth garden soil. Make a bed of this, and leave it for a week, after which you may plant out your seedlings, a foot apart each way. The soil thus made should be light and rich, and it should be loosened round the plants occasionally. Water should be freely given during the evening when required. When the pansies are in bloom, it is well to cut off the dead or dying flowers as in the case of dianthus, and thus a continuance of bloom can be ensured.

A farmer in Florida grows nothing but pansies in his garden. He has a bed only 30 feet long and 8 feet wide full of fine pansy plants. He saves much of the best seed from choice plants only, and from this little bed he has for years made some 40 dollars in a season. He sells his plants packed in earth in grape baskets for from 1 cent a plant to 25 cents a dozen.

Now, this little flower bed would be a mere pastime to cultivate, whilst it would bring in a few pounds every year by the sale of the plants and flowers. Last year we planted out some dianthus plants, and they have remained in bloom ever since, about fourteen months. All that has been done to them has been to loosen the soil, water them, and cut away the dead flower stalks. The blooms indeed are finer now than at first. Try a little flower gardening for profit.

Tropical Industries.

A RÉSUMÉ ON RUBBER.

By E. COWLEY,

Manager, Kamerunga State Nursery, Cairns.

HOW TO ESTABLISH A PLANTATION.

So many fallacies have been made public in regard to caoutchouc (Indiarubber) that a résumé of the subject may with confidence be undertaken. All tropical agricultural journals abound with information on the subject; but we, in tropical Queensland, are isolated through lack of tropical labour, and it would not appear wise to advocate the cultivation of Indiarubber-trees except where the necessary labour can be obtained. There is but little doubt that many rubber-producing plants will grow well in North Queensland.

Mr. Smythe, of Hammond Island, tells me he is obtaining some plants from Ceylon, and it is likely, provided he has the rainfall, he will be more successful than anyone further south in this colony.

Hevea braziliensis, as is well known, grows on the banks of rivers in Brazil, South America, which country affords the necessary humid temperature. It is unlikely that any part of Australia would afford equal meteorological conditions, but it certainly should be tried on Cape York and in the Northern Territory of South Australia. But in this case "*Experientia docet*."

Perhaps the Governments concerned might be interested sufficiently to go to the expense of establishing small plantations for test purposes, as they have done with other plants of economic interest.

To me it seems that the eastern end of New Guinea would form a suitable spot for this enterprise, provided the necessary capital were forthcoming. This, of course, is merely speculation. In any case the seeds of *Hevea braziliensis* do not seem able to sustain the voyage from Brazil to Queensland. Whether from climatic influence or from distance of journey, this cannot be determined. Live plants, however, may be obtained from Ceylon.

Manihot Glaziovii (the Ceara rubber) would appear to come next in value to Para rubber, and this plant undoubtedly does well in North Queensland. But even here it is a question of labour.

The fallacy that the seeds of this plant take twelve months to germinate, has been distinctly proved at Kamerunga. Seeds obtained from Messrs. Christy, of London, germinated within two months of being planted in the open ground without any preparation of seed.

The idea published in the Ceylon papers that seeds planted in fresh horse-dung would germinate still more rapidly, was quite exploded by trial at Kamerunga. Every care was taken; 100 seeds were planted, only six of which germinated after a prolonged period. It has been found by experience that half-ripened wood of this plant will grow readily, while the older wood will not grow at all, except in isolated instances. This was proved by the reception of some cuttings of old wood from Mourilyan Harbour. The younger wood freshly planted grows to a height of 20 feet, and bears flower and fruit within twelve months.

It is better, however, to plant seeds in sheltered positions, and, when the plants are about 1 foot high, to transplant them into their permanent positions. This should be done during the wet season, and the plantation made in a sheltered locality. The tree, like all the family, is tender.

Of course, where it is possible, seeds themselves may be planted where the plantation is to be formed, though this the writer somewhat deprecates.

WHERE TO ESTABLISH A PLANTATION.

Large areas of land suitable for the cultivation of this plant may be found north of Townsville and perhaps to the south. The localities should be chosen in sheltered positions. It has already been remarked that it is a tender plant. This has been demonstrated at Mourilyan, where the trees were blown down by wind and the plantation ruined.

WHEN TO ESTABLISH A PLANTATION.

The seeds of *Manihot Glaziovii* ripen in June and July in Queensland, and those falling to the ground germinate soon after.

The tree itself is a handsome small tree, but, up to the present, no authentic report can be given of its rubber-producing qualities in this colony.

It would appear, however, that there is an abundant supply of milk in the three and four year old trees. I hope to be able to give more reliable information on this subject at an early date.

If rubber-growing is to be established in Queensland, it may be considered this tree will yield the best results.

GATHERING.

After brushing away the loose earth and stones from the root of the tree, the collector lays down large leaves for the milk to drop upon.

He then slices off the outer layer of the bark to the height of 4 or 5 feet. The milk, which exudes in many tortuous courses, some of it ultimately falling to the ground, is allowed to remain on the trees until it becomes solid, when it is pulled off in strings, which are either rolled into balls or put into bags in loose masses.

PRICE.

The value of rubber of all kinds has been steadily advancing in price for the last ten years, until at the present time "Para" is worth from 3s. 8d. to 3s. 9½d. per lb., and "Ceara," properly collected, from 3s. per lb.

Ficus elastica does well in North Queensland, but, as this tree takes such a long time before it can be tapped for its produce, it is hardly wise to recommend it on economic grounds—perhaps more particularly on account of there being some disparity of opinion among Indian growers and elsewhere.

The tree, however, as has been stated in some preceding articles, is not only beautiful in itself, but would form a breakwind for other more tender crops. It would seem that at least twenty years would elapse before this tree could be tapped for a rubber crop.

People having large domains in North Queensland, and wishing to make their holdings beautiful, could hardly do better than plant *Ficus elastica* along their boundaries and carriage drives. The tree is supported by aerial roots, and is consequently able to withstand the strongest winds.

The leaves are most beautiful, and altogether it forms one of the noblest of Nature's efforts.

THE RUBBER INDUSTRY IN THE STRAITS SETTLEMENTS.

In the second volume of the Perak Museum notes, we find some very interesting notes on rubber-producing plants. In Perak the trees producing "gutta" are:—

Getah Taban	Merah	...	...	<i>Dichopsis gutta</i> , Benth.
"	Sutra	...	...	" sp.
"	Puteh	...	...	" <i>polyantha</i> .
"	Chaier	...	...	" <i>pustulata</i> .
"	Simpor	...	...	" <i>maingayi</i> .
"	Sundeh	...	...	<i>Payena leerii</i> .

All the above trees are, or were, common in Perak, and (Mr. Wray believes) are found generally throughout the southern portion of the Malay Peninsula.

Their habitats may be defined as follows :—

- (a) Getah Taban Merah, the tree which yields the best quality of gum, grows in the valleys and likes plenty of moisture, being often found on the banks of rivers with its roots actually in the water.
- (b) Getah Taban Sutra lives in the ravines of the hills up to 800 or 1,000 feet, and also likes to be near water. It would appear to be a rare plant.
- (c) Getah Taban Puteh is an alpine species, and is rarely seen at less than 2,000 feet above sea-level.
- (d) Getah Taban Chaier is found on hilly ground, principally at the base of the higher ranges, up to nearly 2,000 feet.
- (e) Getah Taban Simpor likes hilly ground, and has been found up as high as 2,500 feet, but it is most common on the low hills at the foot of the higher ranges.
- (f) Getah Sundeh grows on the alluvial plains near the sea-coast.

Unless the above facts are taken into account, the cultivation of these trees would probably not be an easy matter, for, as each sort has such well-defined limits when growing in a wild state, presumably they would not thrive out of those limits in cultivation. It would appear to be more a matter of climate than of soil in most cases, for at certain elevations the chances are largely in favour of finding plants of the variety you would expect to meet with, quite irrespective of the nature of the soil.

Given the right species for the situation chosen, there would seem to be no very great difficulty in establishing plantations. It would be necessary either to plant the young trees close together or to plant them in partly cleared land, as, for the purposes of producing a supply of gum, they must have tall, straight, branchless trunks. It is probable that the best plan would be to clear the undergrowth only in a piece of forest land; then plant the gutta trees; and one or at the most two clearings, at intervals of, say, a year, would be all that is required. At the end of that time the trees would take care of themselves.

One great obstacle in the way is the scarcity of seed. This is only produced by the old trees, and the trouble of collection is therefore considerable. These large trees are every year becoming more scarce and, at any rate in Perak, the day is not far distant when all these seed-bearing trees will have been destroyed. The young trees will not bear transplanting, and all attempts at propagating guttas by cuttings have been failures.

A tree of Getah Taban, measuring 2 feet in diameter, at 6 feet from the ground, and about 100 feet high, gave 2 lb. 5 oz. of gutta. Unless there are two growing seasons in the year, the annular rings on a section of the tree showed that it must be 100 years old. Trees of this size could not be planted closer than 50 feet apart, or 17 to the acre; and it appears obvious that a yield of 39 lb. of gutta to an acre of land, after a lapse of even thirty years only, would not be a profitable investment of capital. At 5s. per lb., it would only be worth £9 15s., or 3s. 3d. per acre per year. This estimate is based on actual experiment. By the present native method of felling the tree, only one-fortieth of the gum in the bark is extracted, not taking into account that in the branches and leaves. Supposing that three-fourths of this, or thirty times the amount of gutta given above, could be extracted, the total value would be, from 17 trees, £292 or £4 17s. per acre. The whole question lies in the economic extraction of the greater portion of the gum in the tree.

Mr. Leonard Wray, Curator of the Perak Museum, set to work to try if such results could not be obtained, and he sent home to Kew in 1883 four barrels of the dried bark. This was operated on with bisulphide of carbon, but, although 13·6 per cent. of gum was recovered, the experiment was reported to have been adverse to further shipments.

The next phase of the subject introduces Mons. Eugene Serullas, who went to Perak to consult with Mr. Wray on this subject. Mr. Wray accompanied M. Serullas into the jungle and showed him the rubber-trees, and also gave every aid in his power to the French scientist to test his new invention for the extraction of the gum.

The process is as follows:—The twigs and leaves of the gutta-tree, which are obtained by way of ordinary pruning, having been brought into the store in bundles, are finely chopped up. It is a matter of no moment apparently whether the leaves, &c., are still fresh or dead. The chopped-up stuff is then treated with acid (which is the main secret of the invention) until a reddish-brown liquor is produced. This is put into an alembic, already supplied with a small quantity of water, to prevent the gutta from sticking to the sides of the vessel, and steam is applied for about twenty minutes or half-an-hour, during which the acid evaporates and is drawn off. When the experiment was made by M. Serullas in the presence of the Governor of the Straits Settlements, it was concluded rather too soon, through a desire not to keep His Excellency waiting too long. But there was the gutta, rather more than 1 lb. of it, extracted from 30 lb. of the chopped-up leaves and twigs. When the process has been perfected it is expected that the proportion of 2 per cent. at least of pure gutta will be obtained from the raw material.

When in 1892 Messrs. Rigole and Serullas took out a patent for their process, the secret acid was found to be merely bisulphide of carbon, a well-known solvent of gutta-percha. Since then, in 1896, large orders were received by Messrs. Chasseriau Bros. for dry leaves (up to 1,000 pikuls per month) for an unlimited time at 4 dollars per pikul, and subsequently raised the quantity to 3,000 pikuls per month at 4.50 dollars per pikul. Since, however, Mr. Wray's paper appeared he has received information on what appears to be good authority that the agents in Singapore had stopped buying the leaf, the reason being that there is no sale for gutta-percha extracted by the bisulphide process. It was found on working it up to be of very inferior quality, doubtless due to the conversion of part of the gutta into resin in the tissues of the leaves during the time which elapses between collecting them and extraction in Europe. It is also quite possible that the process itself may have a deleterious effect on the gum.

In any proposal to cultivate rubber-trees, the extraction of gum from every part of them should be considered. It is also quite possible that the trees might be shaved or stripped of their bark in the same way as is the practice with cinchona-trees.

The *Pharmaceutical Journal* of 29th June, 1895, on the annual report of the Botanical Gardens at Buitenzorg (Java), gives some useful information on the point:—"Some interesting experiments made on the leaves of the gutta-percha plants—namely, *Palaguium borneensis* and *P. gutta*—showed that the young leaves yielded respectively 6.5 and 5.7 per cent. of pure white gutta, the mature leaves 4.8 and 6.33 per cent., and fallen leaves 8 per cent. and 8.24 per cent., showing that the *P. gutta* is practically the richer of the two. The larger percentage in the fallen leaves is attributed to the destructive action of the sun and rain upon the tissues."

The question arises, Will these trees stand coppicing, and at what age could they be cut down without killing the stumps? Actual experience only can decide the point. Professor Ramsay says that the tree always comes up again when cut down. It can be cut to within 6 inches of the ground, and will then throw up shoots. Were it not for this, there would hardly be a single specimen in the country. It grows slowly in this manner, but never fails to come up again.

The portion of the tree containing the most gutta, and which is the easiest to handle, is the bark, and it is this which would be the main source of supply, though, of course, others should not be neglected.

RUBBER MANUFACTURE BY SOUTH AMERICAN NATIVES.

THOSE concerned in the caoutchouc or rubber industry will be interested to learn that certain South American natives have long made a practice of waterproofing blankets and of making waterproof garments and bags by a process which originated among themselves, and which was not the result of contact with white men. From the *Indiarubber World* (New York) we take the following account of the process adopted by these Indians, supplied to that journal by a Cuban gentleman, a civil engineer by profession, who has seen much of Colombia. Other extracts from the same journal follow:—

While engaged in some professional work, with a view to reporting on the feasibility of building a railway on the Pacific side of the region of Darien, which forms the south-eastern portion of the Isthmus of Panama, in the Republic of Colombia, the writer had occasion to make some observations on the rubber industry in that part of South America. That country being little known, the work of exploration took a large share of our time, and as we advanced through the virgin forest hardly a day passed without our coming across some rubber-trees. We had little trouble to detect them, because our guides and some of the natives that were with our party to cut paths through the tropical woods were old rubber-men who had formerly, for many years, made a livelihood by selling the rubber which they gathered from the trees, for which they were constantly on the look-out. Of late, however, they had not been very active in that line, because the destructive practice of cutting down the trees instead of simply tapping them to extract the milky juice had made it necessary for them to go farther and farther into the forest.

The practice followed in that region, after felling the tree, is to raise one or both ends a few inches above the ground, allowing them to rest on logs or wooden blocks cut out in the neighbourhood. The ground directly under the tree is cleared as well as possible, and covered with leaves as large as can be procured nearby. Several incisions are then made all around the trunk, and at short intervals, somewhat in the form of a spiral. These incisions are then made all round the trunk, and at short intervals, somewhat in the form of a spiral. These incisions are made deep enough to cut through the bark. The milky juice oozes out along these incisions, and drops slowly on the top of the leaves. These are taken up and emptied into "calabashes," or more often into waterproof bags made by the natives with the aid of their own rubber. In this manner the juice is transported to where it is desired to coagulate it. This is often done in the proximity of the fallen trees. A square hole is dug in the ground to receive the juice, which is mixed with a little common washing soap which has previously been dissolved in water. This mixture is agitated with the hand, and at the end of fifteen or twenty minutes a large portion coagulates and separates from the liquid in the form of a solid mass. This is taken out, and the remaining liquid is again treated with soapwater to make sure that all the available rubber has been precipitated. Before the natives learned the use of the soap to hasten the process, they had to leave the juice in the hole in the ground for many days before it would coagulate. If the trees are tapped instead of felling them, the incisions are made as stated in the previous case, with an additional one running lengthwise. The leaves are crowded around the base of the tree, and the juice drops on them as before.

Several years ago some of the native rubber-seekers became dissatisfied with the price they were getting from the merchants to whom they sold their rubber, and they started a systematic way of adulteration, and they did it with such art that the impurity could not be detected until the rubber was submitted to treatment in the foreign ports to which it was exported. This adulteration consisted of mixing with the juice an equal amount of a certain kind of clay obtained from the neighbourhood. It nearly doubled the weight of the resulting impure rubber, whose appearance did not betray its composition, and consequently they got double the price they would have been paid for the unmixed rubber, the loss falling on the merchant or manufacturer,

after the fraud was discovered. This exposure led the local merchants to be more careful in the selection of the natives to whom they entrusted the gathering of the rubber, and the trouble disappeared.

Besides exporting the rubber in the shape I have described, the natives use it to cover coats or bags to render them waterproof. The cloth to be treated, whether of linen or cotton, is washed, allowed to dry, and then stretched on a framework of sticks. The milky juice, as it comes out of the tree and before it is a day old, is mixed with a little sulphur, and the combination is spread over the cloth with the hands. Two or three coatings are given in this manner, and, after the surface is smoothed over by using long feathers, the cloth under treatment is placed under the direct rays of the hot tropical sun for six or seven hours. The whitish colour begins to turn darker and darker, until it becomes perfectly black when thoroughly dry. It is then removed, frame and all, and placed in running water—generally in the middle of some stream or creek, with several stones weighing on it to prevent its being carried away. It is allowed to remain there overnight, and when taken out the next morning the black tint has washed off and the remaining colour is a brownish yellow. If no sulphur is at hand, they often use gunpowder, which seems to answer the same purpose, but the final colour of the coating becomes black instead of brownish yellow. The use of sulphur or gunpowder, according to the natives, prevents the rubber coating from becoming sticky after it has been dried.

While conducting the explorations already referred to, we extracted the rubber from some trees adjacent to one of our camps, and, by use of the native process described, we rendered waterproof some coats and bags made of common cotton cloth. We used them during the rainy season with very satisfactory results, as they proved to be completely impervious to water. The rubber-tree seems to thrive so well in Darien that its planting and cultivation ought to prove a remunerative investment in that locality.—EDUARDO J. CHIBAS.

In the course of a report which emanated from the Royal Botanic Garden at Trinidad, some four years ago, on rubber from the *Castilloa elastica*, and its uses, the following paragraph occurred:—

In the province of Veragua, a port of the Colombian Republic, which lies north of the Isthmus of Panama, the rubber is well manufactured by the Indians. The process by which the ultimate result is reached is unknown to the writer, but waterproof clothing and bags are produced which would indeed do credit to European manufacture. The most important article in use by the natives is the rubber bag, and, whether proceeding by land or by water, it forms the general receptacle into which all clothes and other property are deposited for safety. The bags are completely waterproof and can bear a long immersion without the contents becoming damp, besides which, when in the shallow and frail canoe of the Indian, it forms a life-buoy of a very effective kind, for, notwithstanding it being partially full of clothes, &c., it will still contain sufficient air to give it buoyancy enough to support a man in the water, and care is always taken to prepare it for such an emergency by inflating it and tying up its aperture securely before starting on a water journey. The material used as the basis to which the rubber is affixed is simply the ordinary unbleached calico or cotton cloth of various strengths, according to the article required. When well prepared these articles are seen to be covered with a soft, smooth, flexible, almost transparent coat of brown-coloured rubber, which is thoroughly waterproof and may be exposed to the sun or the weather for considerable time without injury.

The Denver (Col.) *Republican*, of 28th December, 1897, contained an interview with Mr. H. L. Brigham, of San Francisco, on the rubber interests on the Isthmus of Tehuantepec, from which the following extract is made:—

The manner in which rubber garments are made in the countries where rubber is produced is crude and slow, but when one buys a rubber garment there he is sure that he gets the pure article. I spent several months on the

Isthmus of Tehuantepec some years ago, and was greatly interested in the manner of extracting the sap from the rubber-trees, and the use to which it is put by the natives. When the sap is running it is as white as milk, and very like thick cream. When they want to make a garment they spread the cloth upon a board, and spread the sap smoothly upon the surface with a fine brush. They sometimes make overalls, but as a rule the only garment they make is the poncho, which is about five feet square, with an opening for the head in the centre. The sap turns black soon after exposure to the atmosphere, and coat after coat is spread upon the cloth until the rubber coating is of sufficient thickness. Usually from seven to ten coats are applied.

The only objection to these ponchos made from the natural rubber is that when they are exposed to the sun the rubber becomes soft and sticky, but they are absolutely impervious to moisture. When I first went down there I wore a mockintosh such as are worn in this country, but it was not made to resist such rains as they have in that country, and I was very soon as wet as if I had no protection. Then I bought one of the native ponchos for 10 dollars in silver and was kept dry, no matter how heavy the rain. One tree will yield enough rubber to make two of these ponchos in a single season.

A RUBBER PECULIAR TO COLOMBIA.

IN a recent official report the British Consul at Tolima, Colombia, makes the following reference to a tree which is little known as a producer of rubber. If the rubber is really of good quality, it may in time prove of importance, owing to its adaptability to high elevations, which, as a rule, is not true of rubber-trees. The report says:—

A very important species of rubber is indigenous, and, I am inclined to think, peculiar, to Tolima. Unlike other important kinds of rubber, it grows at high elevations—namely, at from 6,000 to 8,000 feet above high sea-level. Several thousand bales of it were exported a dozen years ago. But, as the tree was only locally distributed, the source of supply was soon exhausted. The authorities at Kew have named this plant *Sapium biglandulosum*, a species which is also said to be found in British Guiana, where, however, it seems to be of no value as a rubber-producer. In connection with the cinchona plantations . . . a plantation of this rubber was made about ten years ago. The trees grew with remarkable rapidity, with trunks a foot in diameter in six years; but this plantation shared the same fate as the cinchonas—that is, it was abandoned years ago because the cinchona was abandoned. With renewed attention, however, this plantation may still be made important.

NEW GUINEA RUBBER INDUSTRY.

WE have received from Mr. E. Cowley, manager of the Kamerunga State Nursery at Cairns, in response to our request for reliable information on the rubber industry in British New Guinea, the following interesting and authentic notes addressed to him by the Hon. A. Musgrave, Government Secretary, and Mr. A. C. English, Government Agent for the Rigo district. There appear to be no companies as yet engaged in the Dependency in procuring rubber, although vague rumours are afloat concerning rubber-producing companies to be established in New Guinea. The “Maki” tree alluded to appears to be a hardy tree, which would seem to be quite indifferent as to the quality of the soil on which it is planted. It should therefore be suitable for certain parts of Queensland, especially as shade is apparently not requisite.

We regret that photographs of the tree are not yet to hand, but as soon as they arrive we will reproduce them in the *Journal*, together with any further information which we can obtain concerning the gathering of rubber on the island.

Government Secretary's Office,

Port Moresby, B.N.G.,

19th April, 1898.

SIR,—In examining some unavoidable arrears of correspondence, I found that your letter of the 9th August last has hitherto been left without any reply.

I referred to Mr. A. C. English, of Rigo, however, as he has taken more interest in the question of "Maki" rubber than anyone else here, and he sent me the letter of which I now have the pleasure of enclosing a copy. Mr. English also intended to prepare some photographs of the tree to accompany his letter, but through some deficiency in his materials has not yet been able to do so. I deferred forwarding this copy of his letter, hoping to be able to forward his illustrations at the same time.

Your *Agricultural Journal* now reaches this office in duplicate with great regularity; one copy I present to the Port Moresby Reading Club, and the other is kept for reference in our official library. The publication frequently contains subjects of considerable interest to persons here, and I beg to express my thanks and acknowledgments for its receipt.

I have not been able to procure the specimens of the "Maki" (*Ficus rigo*) that you request, but will endeavour to do so later. Should I get any further information likely to be of use to you as to our rubber plants, I shall be glad to let you have it.

A. MUSGRAVE,

Government Secretary.

Government Station, Rigo,

4th December, 1897.

SIR,—I have read the interesting articles on the rubber industry in your *Journal* for November last, in which some remarks are made with reference to the rubber-bearing fig of the Rigo district. As I have been in charge of that part of the possession for a number of years past, I am glad to communicate the following notes in case they may be of use:—

In 1892 I found the natives burning rubber for "tattooing," and I have since taken a deep interest in the natural supply and the cultivation of the variety that I regard as most likely to be profitable. Unfortunately, the rubber-producing area is somewhat limited, and the natives prosecuted the industry with such zeal in the first instance that many trees have been killed, and a great number rendered unproductive for some time. The district was consequently "closed" in certain localities, but has now been reopened.

Uncultivated.—The rubber industry of this district lying between the meridians longitude 147 degrees to 149 degrees (about) will never, I think, attain large proportions, as the trees naturally yielding such produce are found in a comparatively narrow belt on the coast. I have not known of one growing at any greater distance than ten miles inland. Within this strip of country, rubber-trees are to be found in the scrub and on its borders. Some grow in open grass land, and a few even on almost bare rock, and only a few feet above high-water mark in the sand. The special tree of which I write, locally known as the "Maki," is very hardy, grows to the height of about 50 feet, and is about 2 feet in diameter. I have found a few specimens that appear to have sprung direct from the soil, but generally the seed probably passes through the stomach of birds, and is deposited in the forks of other trees, from which the roots find their way to the ground, its rapid growth and constriction eventually strangling the foster parent form.

One of the trees, if properly "bled," should give from 5 to 7 lb. of rubber, and could be tapped twice in each year, but the natives of the country will never, I fear, make good collections of this article, unless under the supervision of some person who knows the value of the trees.

Their present mode of collecting rubber is by hacking the trees all over with a tomahawk, and they thus waste in many instances a great deal more sap than they collect. This practice soon kills the trees, besides mixing some portions of the bark with the rubber and injuring its purity. The "Maki" appears to be a tree of very rapid growth, and is, I should think, well worth cultivation. The young trees might be tapped in the fourth year under favourable conditions. About 100 specimens have been planted out (on the "Rigo" flat), and have attained the height of 22 feet in two years, and are 5 inches in diameter. They carry heavy tops and roots, and the latter are now reaching the ground from the lower branches.

I have planted the seed, but failed to get it to germinate. It will, however, grow readily from cuttings of any size. The young trees require no shade when planted out, and very little attention. I shall think it a pleasure to answer any questions with reference to the above rubber plant or take photographs of some of the trees, if they would be of service.

Any publications that you could spare which treat of rubber and other tropical products, I should be very glad to obtain.

A. C. ENGLISH,

Government Agent, Rigo District.

COFFEE IN QUEENSLAND AND OTHER PARTS.

By JOHN DANSEY,
Manager, Mackay Coffee Estate Co., Ltd

PART I.

LANDS cultivated under the influence of a tropical sun have enabled the cultivators from time almost immemorial to draw from the soil an uninterrupted succession of crops of the same kind, which naturally has caused their attention to be more or less diverted from other profitable undertakings to which their lands are equally well adapted. It is but seldom that any good reason can be offered why land in any country should be exclusively devoted to the raising of one particular description of produce. Would it not be wiser for the tropical agriculturist to seek the best means of producing other articles, in addition to his own, for which a ready market is open to him?

Amongst the many industries which I have no doubt could be profitably established in tropical Queensland, I particularly wish to refer to *Coffea arabica*; and if I may be allowed to venture a few opinions thereon, gathered together from a long and varied experience in most of the coffee-producing countries of the world besides Queensland, and if by doing so my humble efforts in dilating at some length on matters relative to successful coffee cultivation may prove of utility to the many now embarking in the industry, I shall feel myself amply rewarded.

SOIL, CLIMATE, ASPECT.

It is of the utmost importance that land chosen for the purpose of growing coffee should be possessed of a free subsoil, devoid of any clayey substance. Land of a boulderous nature may be considered the very best, whilst land in which the rock formation is of a slabby nature should in all cases be strenuously avoided.

Lands undulating and bordering on to steepness will be found most suitable and best adapted to the plant. Flat land or land that does not drain itself is not in any way suitable, inasmuch as where dampness sets in at foot premature decay will follow. High winds and frosts may be put down as the natural enemies of coffee. Great stress is at times laid on the aspect of the land on which coffee is about to be planted, a south-eastern one being generally advocated. This should not, however, by any means be *de rigueur*.

The first consideration of the intending planter should be to see that his land is at all times thoroughly protected from high winds, shelter being of paramount importance to the welfare of the plant at all times of its existence; it is possible in many instances to break the force of the wind by having standing breaks of scrub at various distances apart. If this method is resorted to, the belts should be of great width, not less than three chains through; thin belts of scrub are absolutely useless. The trees being deprived of their natural protection become unsightly in no time, and in a year or two succumb, only to fall in all probability across some of the finest coffee-trees on the plantation and destroy them for ever.

SEED AND NURSERIES.

Much has been said of the preparation of seed, of the site, and of the formation of nurseries—three items which, without hesitation, I give as the most important points to be considered by the would-be successful cultivator. Few people, I regret to say, recognise the fact that the tree once planted out in the field is reputed to last, under ordinary circumstances, a lifetime, and that, therefore, too much importance cannot be bestowed on the quality and preparation of the seed, its propagation in the nurseries, and its ultimate removal to the field.

Strong, healthy trees, of mature age only, should be selected from which seed is to be taken. This seed should not be gathered until the cherry (fruit) has turned a deep red colour. The sooner the preparation of the seed takes place after gathering, the easier the task, and the more satisfactory the result. This is easily accomplished by pressing the cherry between the thumb and forefinger, and shooting out the seeds; but, as this is a work of a somewhat slow and tedious nature, it is equally simple to lay the cherry down on a wooden floor to a depth of 3 inches, and getting a boy to tread it out barefooted. This being accomplished, separate the outer skin (pulp) from the seed (parchment), and immerse the latter in a shallow tub or any receptacle of the kind containing water. Stir once or twice with the hand, and carefully remove all seeds found floating on the top of the water. This is called light coffee, and is useless for seed purposes. The remainder in the tub, spread quickly and thinly in any empty room where the sun's rays do not penetrate. The less the immersion, the better the seeds will be. Turn the seed daily until quite dry, and in about three weeks they should be fit to put out in the nursery. The above I have often proved to be by far the best and least expensive way of curing seed; the slight immersion which is necessary to remove the light coffee not being sufficient to remove from the seed generally the saccharine matter which adheres to it, and which greatly helps its germination when put out.

SITE.

The site for a coffee nursery should be judiciously chosen. The soil should be the best possible, with a plentiful supply of water near at hand. The lie of the land should be such as to afford perfect drainage in the event of heavy rains. A nursery, properly cared for, should be dug over several times to a depth of at least 18 inches, care being taken to remove all stones, roots, and other injurious particles from the soil, and the whole should be thoroughly pulverised. The seed-beds should then be made according to the lie of the land, and in such a way as to facilitate the thorough drainage of the whole nursery.

Different methods are adopted of placing the seeds in the beds; but of all methods I am cognisant of, the most feasible is to have a board cut, say, 3 feet by 1 foot 6 inches, with wooden pegs half an inch long, inserted at distances of 3 inches by 3 inches, or, say, seventy-two pegs to the board. The bed being thoroughly prepared and watered, all that remains to be done is to place the board squarely on it, imparting at the same time a gentle pressure; and, by repeating this process from one end of the bed to the other, the actual number of seeds about to be inserted in each bed can be thus mathematically ascertained.

Great care should be taken to see that no seed be inserted deeper than two and a-half times its own depth, and that each seed be laid with the flat or incised side downwards, and gently covered with soil. Pressing the seed roughly into the soil tends to cake its surroundings, and should not be practised.

(To be continued.)

SUGAR PROSPECTS AT NERANG.

WE are indebted to Captain W. J. Brown, of Nerang, for the following information concerning the operations of the Nerang River Sugar Company during the past season, and the prospects of the district for the approaching sugar season:—

In the season 1897 the company's mill crushed 8,877 tons of cane, making 787 tons of sugar and syrups, which realised the sum of £7,016 12s. 2d. The capacity of the mill is 180 tons crushing power in sixteen hours. The average amount paid to farmers per ton of cane was 8s. 8½d. The cost of cane delivered at the mill was 9s. 10d. per ton. The average cost of manufacture was £4 5s. per ton.

The acreage under cane for the season now at hand is taken at an average of 700 acres of crushable cane, which at present is looking well, except in the very low ground, where the growth is short. Still, the estimated yield of cane on the river is expected to reach 13,500 tons, from which probably 1,500 tons of sugar will be made.

BEENLEIGH AND PIMPAMA.

THE cane crops in these districts are looking remarkably well. Especially on the Albert River do the canefields look so well as to remind the visitor of the palmy days of twenty-eight years ago, when from the Logan to Nerang all the rich scrub lands were under cane, and almost every planter had his own little mill. If the frosts should keep off, the yield of sugar will probably be satisfactory, but this can scarcely be hoped for in the case of cane planted on the low-lying lands. The mills on the Albert River are making every preparation for the coming season, and will probably work night and day to get the crops off quickly. At the Pimpama, there is a splendid crop of cane on Mr. Elliott's farm. Last year some of this was badly frosted, but at present it appears to be good for 20 and in some places 30 tons per acre. There are about 57 acres here under cane, and we understand that the crop has been sold standing to the Nerang Central Mill. The yield of cane is estimated at about 1,000 tons.

BUNDABERG DISTRICT.

FAIRYMEAD sugar plantations will start crushing about the beginning of the current month. It is satisfactory to learn that the estimated output of sugar in the Bundaberg district is 38,000 tons, and we trust this quantity may be realised.

News from Bundaberg is generally of a most encouraging description. The crops are looking well all over the district, and the absence of frost to date affords hope that this visitation is not likely to spoil the splendid prospects in view. Crushing operations will start at an early date, and, with the quantity of cane to take off, work will be pushed on rapidly. We notice by the local papers that complaints of the scarcity of labour are rife in many localities, islanders asking 15s. per week. White labour will be employed largely in the cutting of the cane.

In reference to the purchase of sugar during the coming season, the Colonial Sugar Refining Company have issued a circular to manufacturers of raw sugars that they are prepared to pay £8 5s. per ton, and give a bonus on the same conditions as last year, provided the manufacturers of whites and yellows in Bundaberg and Maryborough only place 35,000 tons upon the markets of Australasia, exporting the residue of their stocks to foreign markets. If these conditions be not complied with, the company will decline to purchase raw sugars from the sugar-growing centres. The manufacturers of white sugars had a meeting, at which they decided to agree to no limit in respect of stock placed upon the colonial markets. They were, however, willing to export to foreign markets *pro ratâ*, according to their total output and the surplus of production over consumption in Australia.—*MacKay Sugar Journal*.

MACKAY DISTRICT.

EXCELLENT weather has again been our portion during the past four weeks, and the crops have made still further progress, and are likely now to come up to the most sanguine expectations. Preparations for an early start of work in the mills are being pushed on rapidly, while there is some trepidation amongst the farmers as to whether all the crops will be taken off.

Amongst recent visitors were Mr. McCulloch, of the Works Department, making an inspection of the mills built under the Sugar Works Guarantee Act, and Mr. Mueller, the chemist of Bingera plantation, Bundaberg. The latter was impressed with the large extent of the district, but not with the appearance of the cultivation, or the weight of the crops, neither of which in his opinion compared favourably with Bundaberg. By the way, he reports the most excellent results this year from drainage at Bingera, a matter which will be of great interest to local farmers. Another interesting hint I picked up in conversation was that good results have been obtained by manuring with the waste liquor from meatworks, superphosphate being added immediately afterwards. This is worth noting by farmers near the Victoria meatworks.

A good many improvements are being put into the mills. Pleystowe has added 64,000 gallons of tank-room, a new vacuum pan, pump, clarifier, boiler, and is lengthening the intermediate carrier so as to secure better maceration. The Marian Central, under the new manager, Mr. Gibson, is also making extensive additions and alterations. Both mills will make a crop of 4,000 tons each or thereabouts, and will probably be put to it to get all the cane treated by the end of the year.

The most important event of the past four weeks has been a visit from the Minister for Agriculture, who, with his colleague the Minister for Public Instruction, spent a week inspecting the central mills, amongst other duties. The administration of the Sugar Works Guarantee Act, formerly in the hands of the latter, as head of the Works Department, is now going into the hands of the Agricultural Department, and the head of that department closely inspected all the mills along the line which he might be called upon to deal with. In the course of some public utterances Mr. Chataway made the interesting statement that, though a small beginning only could be made, he proposed to put a laboratory at the present State Nursery, and immediately initiate a series of experiments of value to the sugar industry. Both Ministers also emphasised the fact that the further extension of the provisions of the Sugar Works Guarantee Act depended upon the present companies fulfilling their obligations to the Government.—*Mackay Sugar Journal*.

PROSERPINE.

AFTER an unusually capricious April, heavy showers and cloudy skies alternating with brief intervals of fine weather, the advent of May accompanied by hot sunny days is an agreeable change. The much-needed bright sunshine has produced a marked effect upon the cane, which is making vigorous growth, and the district generally is looking its best, the grass being very luxuriant this year.

No reports are yet to hand of damage to the canefields through grubs, and I hope we may enjoy our present immunity from this pest, at all events until our farmers are in a position to stand a percentage of loss through this source.

A great factor in checking the ravages of grubs in this district we fortunately possess in our immense flocks of wild birds inimical to the cane grub, and the large flocks of ibis, crow, plover, &c., always following the plough in this district do great execution. One of the earliest measures of our Farmers' Association was to cause the Act for the protection of these birds to be stringently enforced in this district.

There is still a large area of first-class land available for purchase at £5 per acre with easy terms, and more farmers are badly needed.—*Ibid*.

LOWER HERBERT.

THE estimated output of sugar in the Lower Herbert district will probably exceed that of 1897 by over 1,000 tons.

The following approximate figures will enable an idea to be formed of the progress of the industry in that district:—

Cane crushed in 1897	124,000 tons
Sugar made	15,000 „
Tons of cane per ton of sugar	8.5 „
Price of cane delivered at the mills	12s. 6d. to 13s.

Season, 1898—

Total area under crop, about	9,500 acres
Area to be cut „	7,000 „
Probable yield of cane	138,000 tons
„ „ sugar	16,500 „

The combined capacity of the three mills working in the district is equal to about 20,000 tons of sugar per annum.—*Mackay Sugar Journal*.

CAIRNS DISTRICT.

FROM Cairns we hear that the sugar crops are looking remarkably well, and are growing rapidly. It is estimated that the two mills (Hambleton and Mulgrave Central) will have to deal with an output of 100,000 tons of cane during the present season. The whole of this cane, with the exception of about 4,000 tons, is being grown by the farmers. The mills have been making extensive alterations and improvements to enable them to deal with this large quantity of cane. Should they be fortunate enough to turn out a ton of sugar from eight tons of cane, the result should be over 12,000 tons of sugar. We hear also that several intending farmers are looking out for land in the Cairns district, so that doubtless the output of cane will be greatly increased in 1899.

The Mulgrave Central Mill is connected with Cairns by a 3-feet 6-inch gauge railway, 14 miles in length, running past the Hambleton Estate, and it is being extended to Aloomba, a further distance of 4 miles, to enable the farmers to send their cane to Hambleton.

Coffee-growing is greatly on the increase, and crops are reported as good.—*Ibid*.

JOHNSTONE RIVER.

THE cane is looking fairly well, and of course there is a good bit of grub-eaten cane on the River this year, but I think that the grubs have not done any further damage during the past three weeks. However, about the middle of the month the cane all started to arrow, so I suppose that means no more growth, so that will shorten the crops for this district very considerably. Strange, too, it does not confine itself to one variety, as all the varieties have arrowed. The cane has therefore arrived at maturity earlier this season than I have ever known before.—*Ibid*.

MAFFRA (VICTORIA).

THE Maffra Beet Sugar Company commenced operations on the 21st of last month. We are informed by telegram that the work done was fully as successful as expected, and gave great satisfaction. The sugar made analysed a purity of 99.8.

From a statement appearing in one of our exchanges it seems likely that the factory this year will not make more than 1,500 tons, owing to the unfavourable meteorological conditions.—*Ibid*.

Science.

HYDATIDS.

By F. C. WILLS.

THE term "hydatid" is one often used in the Australian colonies, but very little is known of the actual ravishes and prevalence of this disease by the public, and those who are especially in the dark are the very persons most affected by this parasitic immigrant.

The object of this short paper is to place before such a few facts which have come under the writer's notice by actual observation and through information gathered through having been engaged to assist in the investigation of hydatids in sheep. It is, in short, a scientific subject treated in a popular manner, so that the readers may get some idea of the enormous risk incurred for want of knowledge, and it is hoped that the facts here given may prove of practical value in preventing the spread of hydatid disease, although, according to Queensland hospital returns, cases of this disease are less frequent here than in the other colonies. Statistics show that on an average of twenty years 150 persons suffer and 14 die annually from this disease in the colony of Victoria alone; and it is certain were the natural history of this parasite generally known and universally applied in everyday life, the prevalence of hydatids would be to all practical purposes extinct.*

Every squatter or sheep farmer knows what hydatid is when he sees it in his slaughtered sheep. He will often find attached to the liver, lungs, or elsewhere one or more bladders containing a greenish-yellow fluid, and these are what are known as hydatid cysts, which scientific men tell us are caused by a tapeworm which they call *Tænia Echinococcus*. It would be interesting to the curious to know how they get there. In order to understand the life history of the little tapeworm with *such a name*, we will imagine a cyst taken from a freshly killed sheep and thrown to a dog which is sure to be hard by. He swallows it with relish, and you naturally say he will have hydatids. Not so, however, for the dog *never has hydatids*; but the cyst will, in most cases, cause the presence of innumerable tapeworms, such as shown in accompanying Plate XLII.

The cyst was full of *Echinococcus* heads, or scolices, and, being freed from the cyst in the intestine of the dog, they at once commence operations on the intestinal walls by means of their many hooklets and suckers, of which there are four, and which can be distinctly seen under the microscope. See Plate XLII.

In 1866 (according to "Proceedings of the Royal Society, Vol. XX., No. 86") Nettleship carried out some experiments in connection with this tapeworm, and after administering to a dog some of the liquid from a cyst obtained from a freshly killed sheep found, when forty-seven days had expired, that his bowel contained no less than 8,800 specimens of *Tænia Echinococcus*. This gives some idea of the enormous fecundity of the worm, and each one is capable of producing a hydatid cyst or tumour on finding a suitable "host." It is not from the sheep, as many think, that man becomes infected, but from water and dogs.

Anyone who has witnessed the drafting of sheep or cattle on a hot day will readily understand that those engaged in the operation must necessarily breathe in a quantity of dust, thus rendering themselves liable to pulmonary or

* Captain E. C. Owen, of the Geological Survey Department, states that he has seen distressing cases of human beings suffering from hydatids in South Australia, owing to drinking infected water.—Ed. Q.A.J.

lung hydatid caused by the inhalation of the dried and pulverised droppings of sheep dogs. It is the "*materies morbi*" made on the spot. The eggs or minute ova of the adult tapeworm measure only $\frac{1}{370}$ of an inch in length, and contain embryos which ultimately develop into hydatids. They are most commonly conveyed into the stomach of the future victim by the drinking of water, but in all probability often by allowing dogs having these tapeworms to lick the face or hand. The writer has on more than one occasion seen dogs lick the faces of their owners. Children are especially apt to allow dogs they like to show their affection in this dangerous manner, and he knows of a case in Sydney where two children of one family died from hydatids, and it was found that they were the constant companions of some pet dogs. The following instance is taken from the late Dr. J. D. Thomas's work on hydatids:—

"In February, 1879, a child aged two years and one month was brought to the writer, suffering from an enlargement of the liver, which had been first noticed by his mother about six weeks previously. The tumour was aspirated and found to be an hydatid cyst, containing three fluid ounces of clear watery fluid. The extreme youth of the child induced the writer to investigate closely the probable source of infection, and it was concluded, with almost absolute certainty, that it could be traced to a bulldog, which was a constant companion of the child. The mother had noticed frequently that the child was in the habit of sucking the bones which had been gnawed by the dog and lay on the ground about its kennel, and thus, without doubt, the infection had been conveyed from the dog to the child."

Such cases are unlikely to be common, as most pet dogs are fed well under the supervision of their owners, and do not have to hunt round butchers' shops and dustbins for a living as the vagabond dogs do. We must conclude, therefore, that for all practical purposes the domestic dog is the direct source of hydatid infection in man and in the domestic herbivora. But the dog must receive its infection by eating the viscera, or bowels, of animals containing hydatid cysts; and it may be regarded as certain that before the human body can be infected the eggs of the *Tenia* must be received into the system, for there is no evidence that the hydatid cyst of one host can directly produce an hydatid in another when swallowed by the latter. The popular opinion that hydatids in man are caused by eating underdone mutton is totally unfounded. A doctor informed the writer, when both were engaged in experiments in connection with this disease in sheep, that in the event of man swallowing a cyst from a sheep it would have no ill effect.

The spread of *Echinococcus* will be determined by four factors:—

1. By the number of dogs in the country.
2. By the opportunities existing for enabling the eggs bred in the dog to be swallowed by domestic Herbivora and man.
3. By the number of domestic Herbivora, sheep, oxen, pigs, &c.
4. By the frequency with which dogs eat the organs of infected sheep, &c., containing living hydatids.

Therefore, the favourable conditions, if it may be so put, for the spread of the disease, are as follow:—

A district with many sheep, where the dogs are allowed to feed on the offal; the water supply scanty, and procurable only from swamps and dams, on the banks of which dogs may deposit the eggs of the tapeworm in their excrement, to be blown in by the winds, or washed in by the rains. If sheep, oxen, and pigs are few, hydatids will be scarce. If dogs are few, then the tapeworm will also be scarce; and allowing the existence of the dogs, they will not have the tapeworm if they do not eat organs containing the cysts. Should the supply of water be a running one, there is very little danger of sheep swallowing the particular drop of water containing the dangerous egg.

The natural conclusion is, then, that the country with the greatest number of dogs is the most liable to the hydatid infection. It has been computed that in England there is one dog to every fifty inhabitants, and in Iceland one dog to

every eleven inhabitants, and the latter country has the unenviable fame of being that in which *Echinococcus* spreads its worst ravages both in man and beast. An excellent authority, a medical officer in Iceland, states that a trace of this disease is to be found in more than every fifth sheep; and in one district of 3,000 inhabitants and 22,000 sheep, the *Echinococcus* is to be found in every adult sheep, and every third adult person is said to have hydatids.

Climate seems to exert no direct influence upon the spread of the infection, for it is curious to note that chilly Iceland and sunny Australia prove equally congenial to this ubiquitous parasite.

No information is procurable as to the number of dogs in the colonies, but it is certain that their number is far in excess of their usefulness. Some of the larger Australian cities have been obliged to resort to wholesale destruction of unclaimed dogs. In 1882 the New South Wales authorities spent £162 10s. in destroying 1,300 dogs in Sydney. A Ballarat paper wittily observed, in connection with the enormous increase in the canine race, that their "number is legion and their breed is mongrel."

The writer is of the opinion that the spread of this disease is assisted by hunting dogs, as it has been ascertained that in some districts the indigenous animals, such as kangaroos, are highly infested with hydatids, and it is common to allow the dogs to regale themselves upon the livers of the animals. The cystic form is not confined to domestic animals as its "hosts." The following have been found to be hosts: Man, the monkey, sheep, ox, pig, deer, camel, the horse, kangaroo, &c.

It has been stated that the principal medium for the conveyance of the tapeworm eggs into man or herbivora is without doubt the drinking water, and in most cases of hydatid they occur in swampy country. Dwellers in the bush are often obliged to use water which has been lying stagnant for months, perhaps, or die of thirst.

Although the Queensland hospital returns show that this disease is not so prevalent here as in other colonies, it is no reason why we should not be made aware of the means whereby it may be spread, and also any means known to prevent it.

It is evident that dogs should only be kept when absolutely necessary either for the protection of property or station purposes. It is certainly the business of the State to see that there are no stray and useless animals in the cities. The number of mongrels one sees following aboriginals calls for intervention on the part of the powers that be.

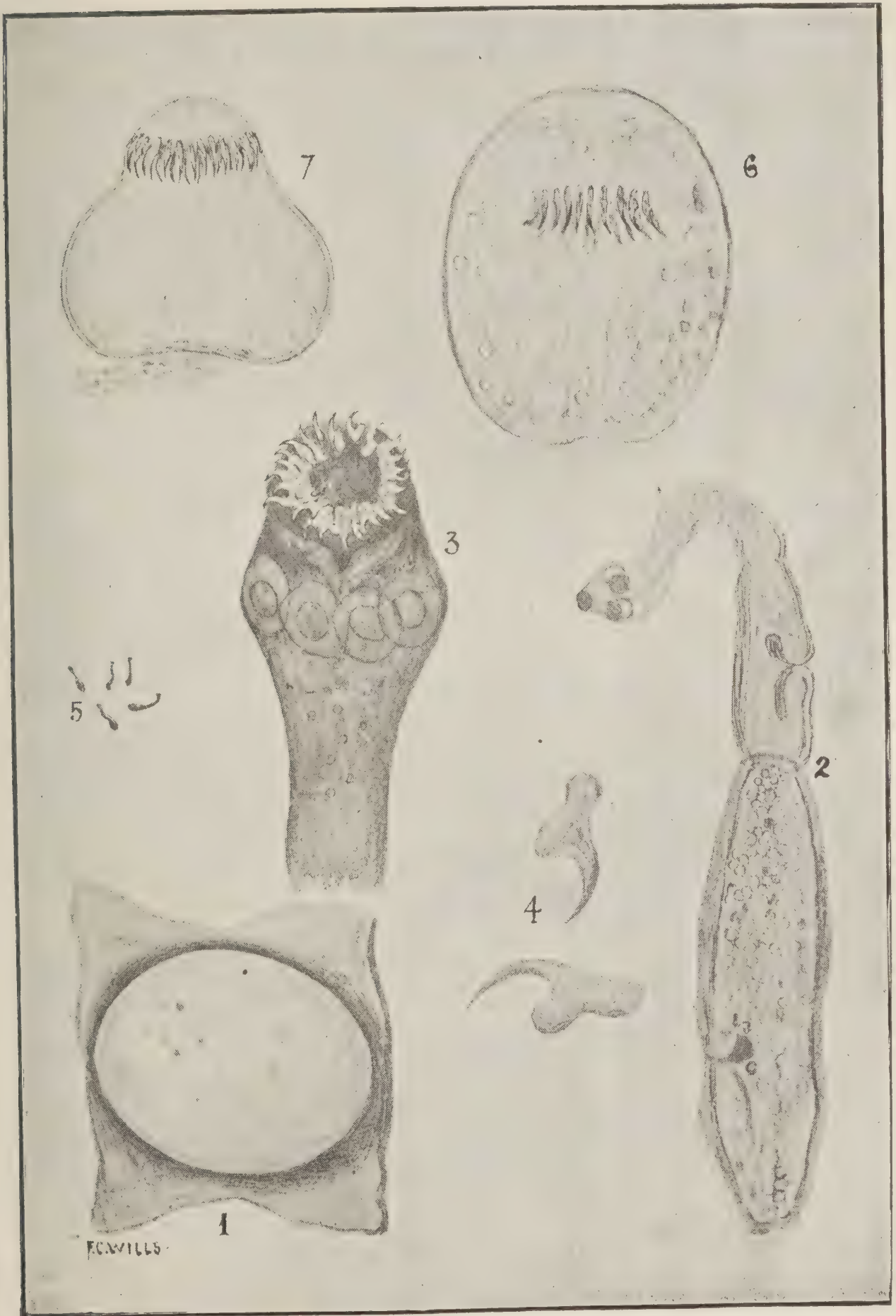
No dog should be allowed to enter slaughter-houses or prowl about offal heaps, &c., or feed on any uncooked meat whatever. It is interesting to know that the fact of boiling or otherwise cooking meat destroys not only *Echinococcus* cysts but also germs of other dangerous diseases—*Cysticercus* (measles), for instance.

Dogs might be freed from the tapeworm by occasional "physicking"; but the excreta should be burnt. If they are kept on the chain they should have their kennels and the ground around them frequently cleansed with boiling water. A very important provision is to keep the water supply scrupulously pure from the invasion of dogs. Keep tanks protected from dust. All water should be boiled or at least filtered before using, as the most sparkling and cleanest-looking water may still contain *Echinococcus* eggs.

REFERENCES TO HYDATID PLATE.

1. Hydatid cyst or tumour from a bullock. After Kuhn.
2. Mature specimen of *Tenia Echinococcus*, procured from stray dog in Adelaide. After Thomas.
3. Head of same, showing suckers and double crown of hooks $\times 320$ diam. After Thomas.
4. Hooklets, highly magnified. After Thomas.
5. *Tenia*, natural size. After Thomas.
6. *Echinococcus scolix* as usually seen, with the circlet of hooks, and the suckers withdrawn inside the general body. Drawn from a slide kindly lent to the writer by Dr. John Thomson.
7. *Echinococcus scolix*, or head, with the rostellum, circlet of hooks, and suckers protruded. Drawn from a slide kindly lent to the writer by Dr. John Thomson.

Plate XLII.



TAPEWORM (*Taenia Echinococcus*).

THE TAPEWORM INFESTATION.

THE following cure is recommended by the *Farmer and Stockbreeder* :—

When a dog is known to be infested with tapeworm, the animal should be shut up and given one dram doses of saintonine, powdered areca nut, or half-an-ounce of turpentine. Twelve hours afterwards he should have a dose of castor oil, which will expel the worms. The disease is easily detected when sheep are attacked. The animal will always turn its head to the side on which the cyst in the head is located. If it should be in the middle of the head, the sheep goes straight on. The infected spot may be located by observing that it is soft over the cyst, and by punching the skull and cyst the serum escapes, and the worms die. If there are many cysts, each should be treated in the same way.

Entomology.

PERNICIOUS OR SAN JOSÉ SCALE.

(*ASPIDIOTUS PERNICIOSUS*, Comstock.)

BY HENRY TRYON, Entomologist.

PLATES (XL. and XLI.)

[INTRODUCTORY.]

DURING the years 1894, 1895, 1896, and 1897, when either no legal restrictions existed or were put into operation with regard to the importation of plants, this insect was repeatedly introduced into the colony and widely disseminated therein on nursery stock supplied by two Sydney firms. As also the right of inspecting orchards was not secured, and the treatment of such as were diseased was not rendered imperative by law, it has already become established by this means in orchards and gardens in several parts of Queensland, including the districts of Stanthorpe, Warwick, Allora, Brisbane, Emerald, North Coast Railway line, Maryborough, Rockhampton, &c.—in all of which localities specimens have been found by Mr. A. H. Benson, Fruit Expert, and the officers associated with him, by different resident horticulturists, or by the writer himself, by whom also the identification in each case has, moreover, been quite definitely established. And “That the San José Scale was introduced into Sydney from California by a nursery firm some four or five years ago upon apple or pear stocks, there cannot be the least doubt; for [and] in every instance where it has been discovered the trees from which the infection spread have come from the same place.” (W. W. Froggatt, I., p. 875.)

It was first noticed in the district of St. José, California, as an orchard pest in 1873, and locally known there as the “Small Round Black Scale.” Being from the first a destructive insect, and manifesting a tendency to spread, its reputation soon extended to other districts, where it was referred to as the St. José (Hosá) Scale. In 1880 it was technically described by Professor Comstock in his elaborate paper on scale insects, contained in the Report of the United States Entomologist for that year; the name *Aspidiotus perniciosus* or Pernicious Scale being assigned to it, because in his opinion “it was the most pernicious scale insect known” in the United States (I., p. 304).

Since its first discovery in California it has become widely disseminated, occurring now in many States to the east of the Rocky Mountains, in British Columbia, Chili, Kauai (Koebele), Australia.

In Japan it is represented by two scale insects—named, respectively, *Aspidiotus albopunctatus* and *A. andromelas*—that do not differ from it by any marked structural characters (Cockerell, XIII.).

Various countries (L. O. Howard, VIII., p. 290-1) have been suggested as its original home, whence it has been transported into regions where it is now found to exist; amongst the number being Chili, the Western United States of America, the Pacific Islands, Australia, Eastern Asia, and Japan. W. M. Maskell and T. D. A. Cockerell have independently, and on different grounds, concluded that it is indigenous to the last-named country; and although there are some difficulties in accepting this country as its source, the origin of *Aspidiotus perniciosus* therein seems probable. The matter of its

original home is, however, of great importance, since it is to be expected that, in its native country especially, natural enemies will be found occurring to keep it in check that may be transported, for the purpose of serving a similar purpose, to the lands whither it has preceded them.

In Australia it has found its way to Western Australia (C. Fuller), South Australia (W. M. Maskell), Victoria (C. French), (?) Tasmania,* New South Wales, and Queensland.

The history of its occurrence in Australia will be found given in the portion of this article relating to the Australian Bibliography of the San José Scale, pp. 508, and need not here be repeated. Suffice to remark that the announcement of its arrival there was first made known by A. Olliff, late Government Entomologist of New South Wales, in September, 1892 (A), and that this discovery was confirmed by the present writer in February, 1895 (C), after doubts had been expressed on Olliff's determination by the late W. M. Maskell, by whom insects from the same source were referred to *Aonidea* (B).

At the close of 1895, R. Hoggan, of Ballandean, submitted specimens illustrative of what he regarded as being a destructive fungus growth, and that occurred upon certain deciduous trees (peaches and plums especially) that he had received during the previous year from a New South Wales nursery, to this Department. These, in the absence of the entomologist from the colony, were forwarded to the Department of Agriculture of New South Wales for identification, and were pronounced by Dr. N. A. Cobb, by whom they were received, to be *Aspidiotus perniciosus*. Early in 1896 this occurrence was verified, and additional ones discovered, in the course of a personal visit made by the writer to the district indicated; the original infested trees in every instance being stated to have been derived in 1894 from one and the same source. This discovery of *Aspidiotus perniciosus* in Queensland was announced in the Annual Report of the Entomologist for 1895-6. (Tryon, G., pp. 38, 41.)

From 1896 to the present date, additional occurrences in the colony of Pernicious Scale have been brought to light, especially during 1898, as a result of inspections of orchards and gardens, made by Messrs. W. Soutter and S. C. Voller. Moreover, a second New South Wales nursery has been found to have been widely disseminating infested trees.

The insect has also been detected on several parcels of fruit (apples) received from New South Wales during the current year.

FOOD-PLANTS.

According to L. O. Howard, Entomologist to the United States Department of Agriculture, the Pernicious Scale has been seen at the Division of Entomology on the following trees:—Apple, crab-apple, quince, pear, Bartlett pear, dwarf Duchesse pear, plum, Japan plum, Satsuma plum, *Prunus pissardi*, *Prunus maritima*, peach, apricot, almond, cherry, Rocky Mountain dwarf cherry, currant, black currant, *Citrus trifoliata* ["this should have been *A. albopunctatus*," *vide* Cockerell], Osage orange, grape, elm, cottonwood, European Linden, American chestnut, *Pyrus japonica*, *Catalpa bignonioides*, walnut, Japan walnut, loquat, red dogwood, juneberry, rose ["it is quite bad on garden roses," *vide* Cockerell], sumac, Carolina poplar (T. D. A. Cockerell, XIII., p. 917), to which list must be added, on the authority of the late C. V. Riley (*cf.* VIII., p. 92) pecan and persimmon. It must not, however, be inferred from these statements that the insect is equally harmful to all of these plants. It may possibly have occurred in South Australia, Western Australia, and Victoria upon Eucalyptus also.†

* Some apples, known to the trade as scarlet pearmain, stated to have come from Tasmania, were found in Brisbane in April, 1898, by E. H. Rainford, Viticultural Expert, one of the inspectors under "The Diseases in Plants Act, 1896," to be infested with a scale that proved on examination by the writer to be the Pernicious Scale.

† *Vid.* Supplementary Note p. 507.

In Queensland the Pernicious Scale has been observed infesting apple, pear, quince, plum (*Prunus domestica*), Japanese plum, peach, nectarine, apricot. It would appear also that the Winter Majentin and Northern Spy variety of apples are not proof against its attacks, though with regard to the occurrence of Woolly Aphis they are usually regarded as being "blight-proof."

INJURY.

On the general subject of the damage effected by this insect, the following testimonies may be cited:—Messrs. Chapin and Vestal, reporting to the Santa Clara (California) Horticultural Society in August, 1881 state that "it does not simply check the growth of the tree, but it covers it literally entirely, and the fruit nearly as much so, rendering it unsaleable and unfit for use, and if left the tree is killed in three years' time." (VIII., p. 124.)

"There is, perhaps, no insect capable of causing greater damage to fruit interests in the United States, or perhaps in the world, than the San José or Pernicious Scale. It is not striking in appearance, and might often remain unrecognised, or at least misunderstood; and yet so steadily and relentlessly does it spread over practically all deciduous fruit trees—trunk, limbs, and fruit—that it is only a question of two or three years before the death of the plant attacked is brought about, and the possibility of injury, which from experience with other scale enemies of other deciduous trees might be easily ignored, or thought insignificant, is soon startlingly demonstrated."—L. O. Howard and C. L. Marlatt. (X., p. 1.)

So far as has up to the present been observed, the Pernicious Scale would appear to be as destructive in Australia as in the United States, to its occurrence in which, these testimonies relate.

APPEARANCES OF INFESTED TREES.

Full Infestation.—Owing to their small size and their colour, that usually harmonises with that of the surface whereon they occur, individual examples of the insect will usually escape the notice of the untutored eye or average fruit-grower, especially if their occurrence is largely restricted to the older bark, as is generally the case in the first instance, until it has already become very abundant. Then we find the bark unlike that of healthy trees, being finely, although unevenly roughened, dull, of a darker hue than usual, greyish-coloured, and covered with a more or less scurfy deposit; looking as if it had been coated with a mixture of lime and ashes or lime and soot, or dusted with a fine powder composed of these matters on a previously applied dressing of some sticky substance. These appearances are well shown in Plate XL., whereon photographs by F. C. Wills, Artist to the Department, are reproduced. Figs. 1 and 2 represent clean and scale-infested bark of the apple as seen without magnification. When infestation is at its height there will be no break in the continuity of these features, and numerous small fissures displaying the inner bark may already be noticeable, especially in the case of the pear. When this stage has not quite been attained, if it be a pear-tree that is being regarded, on close examination one will notice small darkish groups, running into one another of densely occurring, tiny, slightly raised blackish spots like grains of black pepper. In the case of the peach, the usually grey, fine, paint-like matter (well shown in Fig. 4, as it appears when magnified) on the surface of the bark will appear to have been everywhere split open to give presence to similar masses of particles. The above-mentioned encrusting matter may readily be scraped off with a knife or with the finger-nail, or even be removed by aid of a stiff brush, during which operation a yellow oily liquid will be noticeable formed by the crushed bodies of the insects that compose it.

Viewed with a magnifying glass (a good "cotton tester" will serve the purpose) prior to such removal, it will be seen that the entire surface, or that whereon the above-mentioned little groups occur, is covered with minute, rounded or oval, flatly conical scales, the tips of which are crateriformly

ringed. These scales are usually of different sizes according as they are mature or not, and placed side by side or even densely overlapping. Each of them is the outward manifestation of an individual *Aspidiotus perniciosus* insect. These appearances are shown on Plate XLI., figs. 4 and 5, giving the results of higher magnification than that attainable by use of the means named.

Beneath this encrusting mass of scale insects the true bark, dull as if from the application of some corrosive fluid, will be found to be darker than usual, and, on being cut into, to have become deeply tinged with a purplish-brown colour.

If the whole tree is similarly affected, as may happen, this condition obtains on every limb and branch. Some of the latter will have already died, others may emit only weak tufts of leaves from here and there. The plant will in a very manifest manner have ceased to thrive.

Partial Infestation.—When trees are but partially infested attention may be claimed in the first instance by certain peculiar features presented by the young wood, the leaves, or even the fruit; and these are what may be exhibited by nursery stock in a more or less pronounced degree. On the young wood—and especially is this the case with the peach and its allies—and on the bark of the sprouts or suckers, darkened purplish-coloured depressions may be observed that on being closely scrutinised will be found to be occupied by little nests of scales.* Or circular, well-defined purple spots may be noticeable—perhaps one or two only—along the course of the young stems. The centres of these may be occupied by individual scale insects; but this may not happen, as the spots persist long after the latter have attained the limit of their vitality and fallen away. Similarly coloured and conditioned small blotches may be noticeable on the leaf-stalks and leaves themselves; and in the case of the latter usually where the side veins join the central one. In the fruit of different ages, the purple rounded spots may be plainly discerned, especially in the region of the eye. (Plate XLI., Fig. 12.)

It must be borne in mind, however, that the occurrence of these purple spots, with or without scales in their centres, is not absolutely characteristic, as has been repeatedly affirmed.† Glossy (*i.e.*, waxy) skinned apples may not exhibit it; so also may be the case with the wood of certain varieties of trees, especially when the insect has settled down late in autumn; or where the bark has already commenced to harden as in wounds, but generally these spots are nevertheless a good indication of the presence of San José Scale on the stems. The insect, however, if present and not revealing itself by these surface discolourations, will in the first instance be detected—and here the employment of a lens is essential—on the older wood, in the roughened surfaces occurring where branches arise or bifurcate, in old wounds left by pruning, &c., in skin abrasions, and fissures, behind buds, in the cores of apples, beneath their sepals, or even within the calyx tube.

THE INSECT.

The female insects (Plate XLI., figs. 1 and 2), that occur greatly in excess of the males, and which often are alone remarked, have their scales nearly circular in outline and flatly convex, though somewhat pyramidal. The apex is nearly quite central, and is boss or nipple-like. It is usually surrounded by a low circular ring (crateriform). In colour it is of various shades of grey, with a central area (Fig. 1a; exuviae or cast-off skins) varying from yellow to black. In size they may have a diameter of 2 mm. (about $\frac{1}{12}$ inch), but rarely exceed, when massed together, half that dimension. Exceptionally, however, when the insect occurs isolated in young wood, as shown on Plate XLI., fig. 5, as it appears when highly magnified, it may attain nearly $\frac{1}{8}$ -inch in diameter.

* As a pronounced illustration of this:—"Peach trees when attacked by this scale have the branches quite ribbed with distinct hollows in the bark, but sometimes swollen and flattened on the sides, so that even the tissue of the wood seems to have been altered." (Froggatt, *l.c.*)

† A similar purple discolouration immediately surrounding the scale is also sometimes produced by *Aspidiotus rossi*, Maskell. This is especially noticeable when this insect occurs upon the apple, the fruit of which plant is quite conspicuously marked should it be present thereon.

The younger and smaller scales are darker in colour than the older and larger ones; moreover, the central area (or exuviae) occupies a larger proportion of the entire scale in their case than in that of the latter. In each the exuviae, moreover, are equally covered over above.*

On raising a scale carefully with the point of a fine needle, a small yellow particle, readily crushed on slight pressure, will be discerned. This, which is the insect proper, is represented highly magnified in Plate XLI., fig. 2. It measures 1 mm. ($\frac{3}{1000}$ inch) long by $\frac{1}{1000}$ inch broad (Howard), and is almost circular in outline. When examined by aid of the microscope it will be noticed that the body-segments or divisions are slightly indicated, but that eyes, feelers (antennæ), and legs are all wanting. There is, however, a long fine-curved bristle-like organ (Fig. 2a) composed of four hairs, that exceeds the body in length. This is the sucking tube. The hind extremity is elegantly fringed, as represented on Plate XLI., fig. 3. This, that is usually styled the anal segment, presents in this fringe the characteristic features by which the insect may be distinguished. (They are not, however, fully displayed in Fig. 3.) These are as follow:—

The median lobes (Fig. 3a) large, upright, notched on the outer margin; the first lateral lobes small and quite close to the median ones; the chitinous processes of the oval glands between the first median lobe and first lateral ones close together and of nearly equal size; the three smaller pairs of plates, beyond the first pair, narrow, finely serrate, and not fringed. The groups of circular glands present in many other species of *Aspidiotus* are also wanting.—T. D. A. Cockerell, XIII., p. 7.

A full description of the mature female is given by Comstock, I., p. 304, and to this readers are referred, by whom fuller details regarding it are required.

The Male.—The fully developed male scale (Plate XLI., fig. 4) is oblong-oval, nearly twice as long as wide, and averaging in length about half the diameter of the female scale. The position of the exuviae or cast-off skins of the immature insect is marked by a nipple-like prominence located between the centre and the anterior margin of the scale (— Howard). In colour it is usually greyish and of a darker hue than is the female, the apex and ring surrounding it being as a rule conspicuously lighter coloured, usually yellowish. When immature the shape of the male scale is like that of the female.

Beneath this scale the male insect proper will be met with, but not as yet in its adult condition, but as what is technically known as a pupa. In this, as shown by a magnified representation (Plate XLI., fig. 10), there are indications of a well-defined head, feelers (antennæ), wings, legs, and terminal style; all as yet folded up and protected by delicate sheaths. The truly mature insect that arises from this is a minute (almost invisibly small) two-winged fly (illustrated on Plate XLI., fig. 11), presenting the usual organs of locomotion and a terminal organ or style (Fig. 11a), more than half as long as the entire body, adapted for insertion beneath the scale of its consort. This male insect is stated to be 0.6 mm.—or not more than $\frac{2}{1000}$ inch—in length, and is barely discernible without the aid of a lens.

LIFE HISTORY.

Within the bodies of the fully mature female insect may be noticed oval-shaped bodies of different sizes, containing more or less distinct embryos. It is, however, viviparous, or produces its young alive, and not as eggs, as with most other scale insects. Four hundred may thus be born to each individual; not, however, all at once, but during a period of about six weeks, nine or ten, as a rule, issuing every twenty-four hours. The young insect, or larva, that is represented, highly magnified, on Plate XLI., fig. 5, measures 0.24 mm.—i.e., less than $\frac{1}{1000}$ inch in length—and is oval in shape. It has six fully developed legs, each terminating (Fig. 5a) in a slightly curved claw

* They thus become indistinguishable from Maskell's *Aonidea fusca*.—"Trans. N.Z. Inst.," 1894, p. 43.

and four terminally thickened bristles (that enable it, unlike its parent, to crawl freely about), and a hair-like suctorial mouth organ (Fig. 5b). The young of both sexes are alike both in form and habit, and in being exceedingly frail and readily injured insects. After a few hours' wandering about they become stationary, and having inserted their probosces into the underlying plant tissue settle down. Fig. 6 represents the recently fixed larva, and Figs. 7 and 8 the successive outward appearances that are presented by it and that are accounted for by the covering of felted waxen whitish threads with which, in a few hours, it completely covers itself. Whilst in this condition the insect may be recognised by aid of the lens; appearing as a pinkish white ball (shown in some instances on Plate XL. Beneath this covering, after twelve days from birth have elapsed, the insect molts its skin, and with it both legs and feelers. Plate XLI., fig. 9, represents a view of the larva of the male after this first molt. Hitherto the male and female insects have been quite alike, but distinguishing features between the two may now be recognised; though for some time still the scales themselves are outwardly similar, being in both cases circular in outline. In the case of the male a second molt gives rise to a so-called pro-pupa stage, and a third to a pupa one (Plate XLI., fig. 10), and from this in due course issues a two-winged fly, the adult male; meanwhile the scales proper have developed different shapes—that of the female being circular, that of the male oblong. The female insect molts but twice; its discarded skins or exuviae being placed in the centre of the secreted matter that largely composes the scale, instead of in one side thereof as in the male. With the second molt the male insect loses its mouth organs, and so ceases to secure fresh nourishment, but these persist to the last in the case of the female, that thus feeds throughout its entire life. Thirty days from birth the females are full grown, and from three to seven days later begin to produce young. When a female insect has been once visited by a male one, many successive generations may arise parthenogenetically, as in other scale insects, without further union of the sexes.

As previously, remarked each female occupies on an average six weeks in giving birth to its 400 larvæ, but before the last have issued the first born in their turn have produced young, and this is followed successively by a similar event on the part of the younger and still younger progeny; so the broods become very greatly intermixed.*

To demonstrate the rate of increase manifested by the Pernicious Scale, "a series of experiments were performed by the Division of Entomology, Department of Agriculture, U.S.A., at Washington, in which one over-wintered female was placed upon each of seven trees, and when the offspring of these seven were mature all were removed, save one fertilised female on each tree, and the same process repeated until the cold weather closed the breeding season. From accurate observations upon these experiments, it was estimated that, if all the young of one over-wintered female live, the increase from this one and her progeny for the one season would be 3,216,080,400. These would be the descendants from a single insect in a single season, if all fulfilled their functions in life. While it is hardly to be expected that all should live, yet granted that a goodly number should perish prematurely, even then it is readily seen that enough survive to explain the sudden destruction of trees attacked." —(S. J. Hunter, XVI., p. 14.)

"I am satisfied (writes F. M. Webster, Indiana Horticultural Report, 1896, p. 12) that a tree, starting with half-a-dozen young females ready to give birth to young, if nothing be done to stay their ravages or to prevent their unrestricted increase, will be killed down in four or five years, no matter what the soil may be or how vigorous they have been at the commencement of the season."

It has been observed with regard to the occurrence of the San José Scale in the United States that reproduction ceases during the winter months, until the latter part of May, during which the insect remains semi-dormant in a half

* The above facts relating to the life history of the San José Scale have been obtained from the special memoir (X.) by L. O. Howard and C. L. Marlatt, already referred to.

or fully grown condition (Smith, IV., p. 11). And it would appear that in Queensland also there is a similar winter resting period, though probably a much less protracted one than in the former region. Thus it has been remarked that on the Darling Downs no young were being produced during the months of April and May of the present year—1898.

INTRODUCTION, DISSEMINATION.

As already stated, the female insect at a very early stage in its existence has not only lost all vestiges of organs of locomotion, but has also become permanently attached to the plant whereon it occurs. It is therefore itself incapable of moving a single inch. It is not, however, the case with its young or larvæ; these crawl from beneath the parent scale at birth, and continue to move restlessly about for some time, but very slowly; moreover, the active stage that they represent has probably very rarely a duration exceeding forty-eight hours. It may thus sometimes happen, owing to the limited extent of their excursions, that an entire tree may become covered with the scale from the ground upwards to the tips of its branches, before an adjacent one in the same orchard has become at all infested.* The larvæ “get along readily enough on a smooth surface, but are helpless on rough or powdery land, tending to bury themselves in the soil rather than to crawl over it. In most instances they do not get over 6 inches from their hatching-point, provided they have a chance to settle down and are not carried away.” (Dr. J. B. Smith, XII., p. 445.) This amount of activity is, however, compatible with their spreading from plants when these occur growing close together, as in the case of nursery stock. Hence it has happened that thousands of young trees have become uniformly infested in one of these establishments in the course of a comparatively short period—the scales appearing in the first instance upon the stems.

With regard to other modes of dissemination it may be affirmed that the insect is passive, being borne from place to place by agencies that it cannot control. It is wont when still a crawling larva to attach itself readily to objects that come in contact with it by means of the so-called tenent (holding) hairs with which its feet are provided. (Plate XLI., fig. 5a.) Other insects have been found with the tiny young insects attached to their bodies, especially ants, and even so certain beetles, amongst others those that prey upon them. They may also attach themselves to the feet of birds, which latter may also thus serve as agents for their spreading. Instances of this are given by L. O. Howard and C. L. Marlatt (X., pp. 49-50), as already mentioned by the writer in this *Journal* (Vol. I., p. 120) and other writers.

With reference to the work of birds in this connection, F. M. Webster writes as follows:—“That they are carried considerable distances and left upon the branches of trees by birds we have ample proof. On Catauba Island, where the birds were nesting in the badly infested osage hedge, and where other birds were nesting in both infested and uninfested trees, isolated trees were found by the Fruit Commissioners with a single limb seriously affected, and located in the midst of orchards at considerable distances from either hedge or infested trees. In fact, one of the best places to search for isolated colonies of the scale in an infested district is about old birds’ nests.” [XIV., p. 204.]

Again, there are grounds for concluding that in some instances the wind may have contributed to their dissemination; though the special organs that facilitate their attachment to the bodies of other insects and to the feet of birds enable them to maintain a firm foothold upon the bark of trees, and from this, therefore, they are not readily dislodged. Instances in which this method of transportation must apparently be inferred to have operated are given by several writers, especially F. M. Webster. [XIV., p. 204.]

* F. M. Webster has, however, mentioned an interesting exceptional instance to this general rule XIV., p. 204].

The insect may also be carried from tree to tree or place to place on the clothes of human beings who have come into contact with infested trees, especially during the summer months whilst occupied in gathering fruit. It may also, it has been stated, be spread in orchards through the agency of fallen or severed insect-laden boughs, carelessly left on the ground and dragged about with horse implements.

These methods for the dissemination of the Pernicious Scale, though they are not unfrequently made capital of by those who on personal grounds protest against legislative restriction on the free commercial operations in which plants and fruit—whether diseased or not—are concerned, are perfectly insignificant compared with the part played in this work by infested nursery stock and probably fruit.

As regards the latter agency, reference only need be made to the conclusions arrived at by Mr. L. O. Howard (United States Entomologist) (X., p. 97) as well his predecessor in office, the late C. V. Riley (VI., p. 102). In the case of the former of these authorities, this verdict was arrived at after continuous attention had been given to questions relating to the San José Scale for three years by the Division of Entomology, over which he presides. It has, moreover, been intimated in the daily Press that the authorities in Germany, profiting by the past experience of other countries, have placed an embargo on the entry of American fruit into that country in apprehension of the danger threatening their own fruit-growing industry through traffic in such scale-infested fruit.*

Regarding the part played by nursery stock (but not necessarily derived from nurseries) in its wide distribution, testimony is everywhere unanimous. With reference to Australian occurrences, W. W. Froggatt (Government Entomologist of New South Wales) writes during the present year—"That the San José Scale was introduced to Sydney from California by a nursery firm some four or five years ago upon apple or pear stocks, there cannot be the least doubt, for, and in every instance where it has been discovered, the trees from which the infection spread have come from the same place." (I., p. 875.) "It has (writes the Government Entomologist of Victoria) been proved beyond a doubt that the trees in the Wangaratta district, where the first outbreak in Victoria occurred, came from an old and well-known firm of Sydney nurserymen."—C. French (J., p. 4).

The same is the case with regard to Queensland occurrences of the pest, with the difference that two New South Wales nurseries have been concerned, from one of which—*i.e.*, that referred to by W. W. Froggatt—there is testimony forthcoming to prove that infested trees were received as early as 1894.† And in every instance in which this insect has been detected in Queensland orchards or gardens by officers of this Department, or has been reported as occurring therein by correspondents, it has been found on investigation that the trees on which it has been at first—if not exclusively—met with have come from one or other of these two sources alluded to.

* The April number of the "*Zeitschrift für Pflanzenkrankheiten*" (*op. cit.*, Bd. VIII., Heft I.), that has just come to hand, proves the correctness of this announcement; the prohibition (occasioned by the recent discovery of living examples of *A. perniciosus* on imported American fruit) being alluded to in two able articles on the insect—one by Dr. C. Matzdorff ("Die San José-Schildlaus," pp. 1-7), the other by Prof. Dr. P. Sorauer ("Einige Betrachtungen über die San José-Schildlaus und das Einfuhrverbot," pp. 46-52).

† It has usually been the practice of official entomologists to honourably acquit those who are responsible for this dissemination in the first instance, and no doubt such act is in accord with justice. It is usually in their efforts to improve their own stock, and so minister to the development of the fruit-growing industry generally, that their own grounds have become possessed of the San José Scale in the first instance; they have no doubt also unknowingly distributed infected stock (one New South Wales nurseryman supplied three different consignments of trees so conditioned to the order of this Department) in the first instance, and they may have generally—it is believed—taken strenuous efforts to cleanse their nurseries as soon as their condition has been brought to their notice. And thus they merit our full sympathy. It is, however, nevertheless true that they do not cease to widely distribute plants, that may be fairly presumed to be diseased, as long as there is a market for them, and there are no legal restrictions in a trade in this description of merchandise, as happens to be the case at present in New South Wales. It is probable, however, that nurseries whose reputation has been established will not jeopardise it by sending out stock that is conspicuously infested with this insect, though it is the inconspicuously diseased from which the greater danger may be anticipated.

By the term "nursery stock" is intended not only entire plants, but also cuttings, grafts, and buds; the last being a prolific and often unsuspected source of further infestation, the young scales occurring ensconced within them when the trees from which they have been derived are apparently free.

The list of the food-plants of the Pernicious Scale, given on page 495, is suggestive of the possibility of its being introduced into new countries, or further disseminated in those in which it already occurs, on other than deciduous fruit trees, especially by the agency of members of the order Rosaceæ. Amongst the number may be mentioned linden, spindlewood (*Euonymus*), Spiræa, rose, hawthorn, cotoneaster, *Acacia*, elm, alder, weeping willow, on all of which the occurrence of the insect has been definitely ascertained.

The fact that the insect occurs upon trees in a dormant condition at the season of the year best adapted for traffic in orchard trees generally favours its distribution by the latter.

The ordinary deciduous fruit trees are, however, the principal vehicles on which it is introduced and disseminated. Judging also from the condition of fruit occasionally received from New South Wales, the insect must be quite as frequently transported from district to district in Australia by this means as in the United States.

INSPECTION,

From the foregoing description of the insect and its mode of occurrence, badly or even moderately infested plants may be detected and so dealt with. It may happen, however, that one or two scales only (and what are the chances of one or two of these minute insects occurring in a bundle of fruit trees being detected) may occur upon a plant, and these be still immature; but the possibilities resulting from even this limited infestation are serious to contemplate (*vid.* p. 499). Further, a but slightly infested tree may have provided young for the contamination of previously clean ones, though these young cannot by reason of their diminutiveness yet be discerned upon them. Accordingly the injudiciousness of pronouncing trees on which Pernicious Scale may be expected to occur clean after inspection only, is very evident. This ultimatum—if forthcoming at all—should result from a knowledge that they have been shortly previously subjected to an effectual process of disinfection, preferably under the direction of one called upon to deliver it.

NATURAL CHECKS AND NATURAL ENEMIES.

Though, as L. O. Howard has pointed out, the Pernicious Scale belongs to a class of insects that are facultative cosmopolites—or adapted to becoming very generally naturalised over the earth's surface—it would appear that special conditions of climate may oppose an obstacle to its natural increase, or indeed even to its permanent establishment in some regions. The United States have been mapped out by an American meteorologist into several climatic districts or life-zones, and the above-mentioned entomologist has shown that the Pernicious Scale would appear to have become established there in the so-called austral life-zones only. And the application of this discovery to its distribution in the State of Massachusetts he showed, at a meeting of the Massachusetts Horticultural Society, in 1896 (*vid.* IX., p. 85). With regard, however, to Queensland and Australia generally, sufficient data have not been accumulated to admit of profitable speculation as to the ultimate effect of climate on the prevalence with which the insect will attack vegetation in particular districts being entered upon.

There are, however, other natural checks, consisting in the occurrence of infectious parasitic diseases and predaceous insects—both parasitic and others—that would appear to be as operative here as in the United States of America.

With regard to the latter region, these have been dealt with by L. O. Howard (X., pp. 51-5, and VIII., pp. 289-90) and other writers, more especially by Dr. J. B. Smith (XII., pp. 517-540), and need not be further referred to on this occasion, though the desirability of procuring if possible the establishment of the parasitic and predaceous insects alluded to in Australia may be insisted upon.

It has, however, been stated with regard to one internal parasite, a minute hymenopteron named *Aphelinus mytilaspidis*, Le Baron, that in one instance it had been found to have fatally victimised Pernicious Scale insects to the extent of 63 per cent. The well-known above-mentioned New Jersey entomologist—to whom the writer is under many obligations—has, moreover, affirmed that “there is little doubt but that south of San Francisco the scale has been kept in check by natural causes [the work of insects being referred to—*H.T.*], and has been reduced by them to its present harmless condition (there).” (XI., p. 5.)

Similar natural checks on the increase of the San José Scale are afforded in Australia by both internal and external predaceous insects. W. W. Froggatt writes: “Whilst examining an apple-tree at Benowa, New South Wales, infested with *Aspidiotus perniciosus* I found a number of both the perfect beetle and larvæ of a small black ladybird (*Rhizobius debilis*, Blackb.) feeding upon the young scale.” (I., p. 880.)

A related insect to it—apparently *Rhizobius hirtellus*, Crotch—was observed in the performance of a similar service at Stanthorpe in 1896. The most effective beetle in Pernicious Scale destruction in Southern Queensland is, however, probably the six-spotted *Orcus* (*O. australasiæ*, Dej.), a ladybird whose useful work in repressing pests of the class to which it belongs was already pointed out by the writer in 1889 (*vid.* “Insect and Fungus Pests, Brisb. 1889,” page 136). This beetle, both in its larval and adult condition, mows the insect down to the bare bark with its jaws. Unfortunately, however, it is only locally prevalent. In 1896 it was introduced to the orchard of Mr. R. Hoggan, of Ballandean, by the writer, and, it is thought, assisted in the extermination of the San José Scale that had become accidentally established there at an earlier date.

W. W. Froggatt also writes that, on the occasion previously alluded to, he observed “that many of the larger stems were covered with a fine web, and upon removing it was exposed a slender caterpillar. A number of these were collected, and within a week, after being fed on San José Scale, spun elongate, oval, white, silken cocoons upon the foliage, and perfect moths emerged on the 27th November, a fortnight after they were collected” (I., page 880). This insect, or one closely related to it, has been found to occur also, feeding in April upon Pernicious Scale on the Darling Downs, Queensland, having been met with by the writer in association with its host when wood infested by the latter was received at his office. The Queensland insect presents the following features:—

It is a small tineid moth, having narrow, reddish, fawn-coloured, black-speckled forewings and almost linear dark-grey hind ones, both pair being fringed with long dark-grey cilia, which in the case of the forewings become of more pronounced hue towards the apex. The insect is also endowed with a peculiar tuft of long-curved whitish scales on the front of the head. It has a wing expansion of 14 mm. ($6\frac{1}{2}$ lines).

The same insect was referred to by the present writer in 1889 as feeding upon the White Scale of the orange (*Chionaspis citri*) in the manner described by Froggatt, in a work issued by this Department in 1889 and again in 1894 (*vid.* “Insect and Fungus Pests,” 1889, p. 128; and Bulletin (Depart. Agr. Qd.) No. 4, 2nd series, p. 14). Judging from the little that it accomplishes in subduing the orange scale-insect mentioned, not much is to be expected of it in checking the increase of the insect pest under notice. However, the discovery on the part of the Government Entomologist of New South Wales, now confirmed, is a matter of more than scientific interest.

Again, the writer has detected the presence of a small hymenopterous parasite victimising to a limited extent the Pernicious Scale, on the Darling Downs also.

The insect is also kept in check, at least in the coastal districts of the colony, by a parasitic fungus named *Microcera coccophila*, Desm., or *Sphærostilbe coccinea*, Tulasne. The useful offices of this vegetable parasite, as a scale-insect destroyer of the Circular Red Scale (*Aspidiotus aurantii*), was pointed out by the writer in 1889 (“Insect and Fungus Pests,” p. 130), and again as injuriously related to the same scale insect and to the Circular Black (*A. ficus*), and to Glover’s Mussel Scale (*Mytilaspis Gloveri*) in 1894 (Bulletin, No. 4 2nd

series, p. 15), but it is only during the present month that it has been found in Queensland injuriously associated with the San José Scale, Mr. S. C. Voller, to whom it had been previously pointed out as an enemy of the Red Scale (*A. aurantii*), having detected its presence in an orchard at Cooran, some 100 miles from Brisbane, on the North Coast Railway line. This fungus is recognisable by the occurrence of conspicuous pinkish-red excrescences around the edges of the scales, that may occur as isolated lobes or—by amalgamation—form a complete raised ring. This projecting matter is composed of elongated septate spores (conidia). Scale insects affected in this way are often regarded by horticulturists as examples of a distinct kind, and designated the Pink Scale. Usually when scale insects are parasitised by *sphærostilbe*, almost the whole of those occurring upon a tree, on which they exhibit this condition, are similarly victimised.

The same fungus has previously been found attacking Pernicious Scale in the United States, and is referred to by Coquillett (Bull. 26, Divis. Entom., U.S. Dep. Agr.), by Messrs. L. O. Howard and C. L. Marlatt (X., p. 54), and others. A full and most interesting account of it, too, is given by Dr. J. B. Smith (XV., pp. 470-483), that is especially valuable as incorporating a special paper on its biology by Prof. S. A. Forbes. From this paper we learn that the Illinois professor was successful in artificially cultivating the *Sphærostilbe*, upon peptonised gelatine, potato [bread], and cornmeal. Cultivations from the last-mentioned substance were applied to Pernicious Scale-infested trees, but without any positive result in infecting its living freight. A better issue to the experiments might—it is inferred—have followed the maintenance of the cultivation after being applied to the trees in a favourable condition for securing germination, and especially so if the bark had been kept moist for a few days. Dr. Smith expresses himself as being “quite hopeful for good results from this fungus,” though he adds “our experience with similar diseases against other insects does not give us any just reason to expect that it will do more than check the scale. In favourable seasons it may reduce the insects to very small numbers; but with their wonderful powers of reproduction a year or two will bring them up to their former point. The worst feature is that moist conditions are required for the best development of the fungus, while it is in a dry state that the scale is most active. Wet weather, especially if at all cold, is in itself a check to the scale, while in dry, warm weather it increases enormously” (*Op. cit.*, p. 477).

This is exactly the writer's experience in Queensland not only with *Sphærostilbe coccinea* in its relation to the scale insects mentioned, but with *Sphærostilbe rectispora*, Cooke, of the White Scale of the orange (*Chionaspis citri*) (*vid.* “Insect and Fungus Pests,” p. 128-9, Brisb. 1889), and with the fungus destructive to the species of *Lecanium*.

TREATMENT.

Trees regarding which it may be presumed that they harbour San José Scale, and those on which it is observed to occur, should be disinfected before being planted, by being (1) immersed for not less than two minutes in a warm wash prepared by dissolving whale-oil soap in water in the proportion of 1 lb. to every gallon,* or (2) by being fumigated with hydrocyanic acid gas made by subjecting cyanide of potassium to the action of weak sulphuric acid, using the following quantities for every 100 square feet of space:—Fused cyanide of potassium, pure (98 per cent. strength), 1 oz. weight; sulphuric acid-commercial, 1 oz. by measure; water, 3 oz. by measure. Unless a special generator is employed, a deep earthenware vessel may serve the purpose; into this put in first the water, then the acid, and finally the cyanide.

*If the wash becomes “glutinous and stringy on cooling,” it may be assumed that the soap is of inferior quality. The following directions for making a suitable and exceedingly caustic soap are given by more than one authority:—Ingredients: Concentrated lye, 3½ lb.; water, 7½ gallons; fish oil, 1 gallon. Process of manufacture: Dissolve the lye in boiling water, and to the boiling solution add the fish oil; continue boiling for two hours, and then allow to cool.

A suitable arrangement for fumigating nursery stock is a gas-tight box of convenient size, made of tongue-and-groove wood put together with white lead, with the door or cover closing against list or felt and capable of being clamped into place, one corner being partly boarded off to hold the earthenware jar, and above it a ring that connects with a slender rod leading to the outside to serve the means for inverting the cup (in which the cyanide may be placed) that is fixed into it. The box may be rendered to a further extent tight by the use of grafting wax.

For the accomplishment of the same work the following method may also be employed:—Pieces of wood of equal length are set up at the four corners of an oblong piece of ground and united above by four horizontal bars. The ground is surrounded by a shallow trench containing loose earth. The plants being placed within the enclosure, the whole is now covered with a sheet of duck (8 oz.) or drill already rendered gastight with boiled linseed oil; and of such dimensions that its edges dip well into the ditch and turn up. These are now well covered with the loose earth of the ditch, and one corner of the sheet raised and quickly lowered again to add the cyanide of potassium to the acid and water in a previously introduced earthenware vessel.

All trees dealt with in this manner should be in a dormant condition, and it is, moreover, desirable that the unprotected roots be not exposed to the direct action of the gas of the strength indicated. Nursery stock is therefore best treated after being previously closely heeled in.

In using hydrocyanic acid gas it must be borne in mind that both it and the cyanide from which it is derived are violent poisons. The latter, therefore, when not in use, should be kept under lock and key, and care taken not to breathe the gas itself. It should not be generated, moreover, until the box in which it is to be evolved be closed; and special precautions should also be taken in opening the latter when the process is complete and in allowing it to escape. Moreover, operations involving its use should, if practicable, be conducted in the open air or in an open shed.

If the Pernicious Scale already occurs in the garden or orchard and only a small proportion of the total number of trees that it contains are infested, it will be generally expedient to cut these down, and burn them if possible without removal. Big old trees and neglected or abandoned ones harbouring the insect should be similarly dealt with; for in the first instance the risk of avoiding further dissemination should be opposed, even though such action as is recommended involve considerable sacrifice; ridding big old trees of scale is a costly work; and public nuisances should be abated.

The treatment of Pernicious Scale-infested trees that it is decided shall not be destroyed is a matter of considerable difficulty. When the insect is especially vulnerable—that is, when it occurs as an active unprotected larva—the employment of direct treatment (other than that which consists in the use of hydrocyanic acid gas) is not liable to be attended by any certain result, unless repeatedly resorted to—a procedure that is not economically justifiable. This is because the young do not issue from the parent scale together, but continue to emerge during many successive days (*vid.* p. 498), so that an application that is fatal to the early born young of any individual does not come into contact with those that shortly succeed them. And, moreover, when the young are about—*i.e.*, during the summer months—washes that will kill them, and at the same time penetrate and so destroy the parent scales as well, cannot be safely employed since they require to be of such caustic strength as will injure the trees themselves also. Accordingly, measures must be directed towards the mature insects, and sufficiently concentrated washes employed to accomplish their destruction, and winter treatment, when the buds are dormant, must be therefore largely depended upon for the accomplishment of really safe and successful work.

With regard to this treatment, carefully conducted experiments (*vid.* Howard and Marlatt, X.) and lengthy experience in the work of subduing the insect under notice in the United States, carried out by them and other workers, indicate the following amongst the better methods of procedure:—

The trees after being cut right back should be sprayed with the whale-oil soap wash previously described, which must be applied with such force as to find an entrance into all the crannies resorted to by the insect. The full results following the application of this wash, it is stated, are not usually apparent till some weeks have elapsed, and occasionally it may be found necessary to make a second application. L. O. Howard, in summarising the outcome of a number of carefully conducted experiments (*vid.* VIII., pp. 293-5; and X., pp. 108-9), carried out at Washington during the winter 1893-4, states that “the only absolutely perfect results which have been reached have been attained by using this soap preparation” (and another that is not only costly, but very liable to injure the trees to which it is applied).

In California good results have followed the use of a winter spray composed of lime, salt, and sulphur prepared as follows:—Ingredients: Unslaked lime, 40 lb.; sulphur, 20 lb.; stock-salt, 15 lb.; water, to make 50 gallons. Process of manufacture: “Place 10 lb. of lime and 20 lb. of sulphur in a boiler with 17 gallons of water, and boil over a brisk fire not less than an hour and a-half, or until the sulphur is thoroughly dissolved. (When this takes place the mixture will be of an amber colour.) Next, place in a cask 30 lb. of unslaked lime, pouring over it enough water to thoroughly slake it; and whilst it is boiling add the 15 lb. of salt. When this is dissolved, add to the lime and sulphur and cook for an hour longer, when the necessary amount of water to make the 50 gallons should be added.”—Dr. J. B. Smith, XI., p. 551-552. This application is liable to be washed off by rain before it has fully served its purpose; it therefore gives its best results when used in a dry climate.

The composition of other somewhat similar Californian washes as well as Oregon modifications of them are given also by the last-mentioned authority. They, however, are, like it, not only troublesome to make, but they are also exceptionally severe upon the hands of the operator and upon ordinary spraying appliances.

Moreover, according to L. O. Howard and C. L. Marlatt (*cf. op. cit.*), when these washes were experimented with under test conditions at Washington, the results following their use were entirely unfavourable. In explanation of this, however, it has been suggested that the difference between the Pacific and Eastern States, as regards climate, influences the efficacy of their use.

In some instances good results have followed painting the entire wood, also in winter when the buds are dormant, with (1) a wash composed of $\frac{1}{2}$ -lb. of commercial potash, $\frac{1}{2}$ -lb. of caustic soda, and five quarts of water, or a practically saturated solution of the salts named (C. V. Riley, “Report of Entomologist,” 1893); (2), pure kerosene; and (3), a mixture of linseed oil and the latter body (three parts of the former to one part of kerosene)—a combination favourably reported on by R. Hoggan (*in lit.*)

The winter treatment may be profitably supplemented by the application of summer remedies, notwithstanding the drawback to their employment already referred to. These, as recommended by the United States Entomologist, might consist of standard kerosene emulsion (Riley-Hubbard formula), one in ten parts of water; or a whale-oil soap wash of 1 lb. to one gallon strength (Howard, IX., page 91.) Either of these, however, would require to be used at least three times at short intervals.

From what has been already recorded (V., p. 154, there can also be but little doubt (for unsatisfactory results in some instances *cf.* xv., pp. 467-8) but that when orchard trees that have become infested with the Pernicious Scale are subjected to the action of hydrocyanic acid gas, they will by its use be rendered free

from its presence. The outlay that the adoption of this treatment necessitates is, however, sufficiently great to forbid its employment except when the appliances are owned and utilised by individuals, companies, or societies that make it their special business to conduct such operations at a stipulated cost per tree, as is already done in California; or when there is a co-operation in the work between Government and grower, resulting in the supply of labour by the latter, and of outfit, chemicals, and skilled supervision by the former.*

In conclusion, should any of the readers of this article discover upon their trees any scale insect that they may either infer to be San José Scale from the foregoing description, or regarding the nature of which they, notwithstanding it, have doubt, it will be in their interest to forward portions of the wood whose condition has claimed their attention, or aroused their suspicion, to this office—that their true state may be ascertained, and that—should the pernicious insect be present—they may be furnished with the latest information to hand with regard to the best means for its extermination.

PERNICIOUS SCALE ON EUCALYPTUS

Supplementary Note.

In 1895 the late W. M. Maskell announced (Trans. New Zeal. Inst., vol. xxiii., p. 386) the receipt, from G. Quinn, of Adelaide, of twigs of *Eucalyptus corynocalyx* thickly covered with scale insects that he concluded were identical with *Aspidiotus perniciosus*. "The puparia (he writes) in this instance are very dark-grey, and the larval pellicle is orange-red. The second pellicle is not visible until the scale is turned over, and then only indistinctly. But the characters of the adult female are quite clearly those of *A. perniciosus*. I have also the advantage of finding some adult males which are identical with the figure of *A. perniciosus*, given in 'Insect Life' (vol. vi., p. 367)."

Two years after this C. Fuller ("Notes on Coccidæ—I., Some Coccidæ of Western Australia," p. 4, Perth, 1897) recorded the occurrence in Western Australia of a scale insect on Tasmanian gum (*E. globulus*) that he regarded as being a variety of *Aspidiotus perniciosus*, but a distinct insect. This he named "eucalypti." In his description he gives the colour of the scale proper as "purple black," but, however, does not point out in what features the distinctive characters of the variety reside.

Finally, during the present year, C. French has stated ("The San José Scale, 1898," p. 8) "the fact of a variety of San José Scale, named *eucalypti*, being very plentiful on bark of gum-trees in parts of the Wangaratta district" of Victoria. The appellation "eucalypti" is, moreover, attributed by him to Maskell (French *in lit.*)

Assuming that the scale insects mentioned as occurring upon Eucalypt, in Victoria, South Australia, and Western Australia, respectively, represent a single species (although even with regard to this there is doubt), it is therefore uncertain whether this be identical with the San José Scale, or different from it—as C. Fuller's and C. French's statements seem to imply. This is a matter of importance, since if they are identical the work of coping with the Pernicious or San José Scale will be complicated by reason of its infesting native trees in addition to those of our orchards; but if different this difficulty will not have to be encountered.

With regard to South Australia, the United States authority on Scale Insects, T. D. A. Cockerell, has stated ("The San José Scale and its Nearest Allies," p. 15) that he is "quite convinced that the supposed variety of *perniciosus* recorded by Maskell as on *Eucalyptus* in Australia is not that insect; the description reads more like *A. forbesi*, but it is very likely something else."

Again, from an examination of specimens of the Wangaratta insect, obligingly communicated by the Government Entomologist of Victoria, the present writer has no hesitation in pronouncing them as quite distinct; as is very evident when regard is had to minute structural features. Thus in typical examples of *A. perniciosus* it will be found, on examining the terminal segment of the body, that the marginal plates or "squames" are narrow and very feebly serrate on their anterior sides, whereas in *eucalypti* they are conspicuously branched or fimbriate in this position, as in *A. howardi*, Cockl. Moreover, in the latter insect, the lateral lobes are narrower, and though obtuse somewhat obliquely truncated, with the emargination apparently obsolete. These characters co-exist, in the specimens under examination, with a special colouration of the scale. This is pale testaceous brown, without any trace of black or grey, with the exuviae (pellicles) orange-yellow, especially when viewed from beneath. This colouration is also participated in by the scales when still immature. (However, the examples are dry and long gathered.)

C. French writes (*l.c.*):—"It is not known as yet whether this variety will attack fruit trees or not." The outcome of the present examination would lead one to suppose that the latter event will not be found to transpire.

* The fumigation of trees for the extermination of scale insects as a procedure in orchard work has already passed far beyond the experimental stage, and is already extensively resorted to in some countries. The description of the process as conducted, as well as of the appliances used, must, however, form the subject of a special article.

AUSTRALIAN BIBLIOGRAPHY OF SAN JOSE SCALE INSECT.

[Works referred to in foregoing text by letter.]

(A) 1892. A. S. Olliff—

"Two little-known Scale Insects affecting Fruit Trees," in "Entomological Notes," *Agricultural Gazette of New South Wales*, Vol. III., p. 698, September, 1892.

[In this, scale insects occurring on fruit, leaves, and twigs of pear obtained at West Maitland by A. H. Benson are determined to be *Aspidiotus perniciosus*, Comst.; the significance of the discovery is, moreover, pointed out, and remedies, including resin-wash, and lime, sulphur, and salt mixture for coping with the pest suggested.]

(B) 1894. W. M. Maskell—

"Further Coccid Notes," &c. Paper read before Wellington Phil. Society, 4th November, 1894. "Transactions and Proceedings of the New Zealand Institute, 1894," Vol. XXVII., p. 43. [An insect forwarded by Mr. C. French as coming from, Bulga (West Maitland), New South Wales (and received by him from A. H. Benson), is described under the name *Aonidea fusca*, sp. nov. No reference is made to Olliff's paper, and *Aspidiotus perniciosus* is not mentioned as being possibly identical with *Aonidea fusca* or in any other connection.]

(C) 1895. H. Tryon—

"Notes on Insect Pests"—(I) "A Formidable Scale Insect." Paper read before the Natural History Society of Queensland, 21st February, 1895. *Brisbane Courier*, 25th February, 1895; *Queenslander*, February, 1895.

[Records receipt of specimens on peach from New South Wales, forwarded by A. H. Benson, under the name *Aonidea*. These are identified with *Aspidiotus perniciosus*, Comst., and the full significance of the occurrence pointed out. This author also writes:—"As early as 1892 the same scale insect was recorded as occurring in New South Wales, but another insect, as has been stated (the above-mentioned *Aonidea fusca*, Maskell), was then mistaken for it." (The identity between *Aonidea fusca* and *A. perniciosus* not having in February, 1895, been as yet suggested—H.T.)]

(D) 1895. A. H. Benson—

"Some Fruit Pests—A New Scale on Fruit Trees." *Agricultural Gazette of New South Wales*, Vol. VI., p. 251, April, 1895.

["A roundish, small, dark-brown almost Black Scale" from Bulga, near Singleton (West Maitland district), and most destructive to peach-trees there, but not known to the author to occur elsewhere, referred to (without name or further description or reference to the identifications of Olliff, Maskell, or Tryon, respectively). Contains also suggested remedies.]

(E) 1895. W. M. Maskell—

"The Pernicious or St. José Scale—*Aspidiotus perniciosus*, Comstock, and *Aonidea fusca*, Maskell: A Question of Identity or Variation." *Agricultural Gazette of New South Wales*, Vol. VI., pp. 868-870, December, 1895; *Canadian Entomologist*, January, 1896, p. 14. The author expresses himself as being "strongly inclined to think that he had previously made a mistake in separating the two insects, at least specifically."

(F) 1895-6. W. M. Maskell—

"Further Coccid Notes," &c. (Papers read before Wellington Phil. Society during December, 1895, and February, 1896.) "Transactions and Proceedings of the New Zealand Institute," 1895, Vol. XXVIII. Under *Aspidiotus*

perniciosus, Comstock (p. 386), reference is made to specimens received on apple and pear from Melbourne (C. French) and New South Wales (A. H. Benson), and on *Eucalyptus corynocalyx*, August, 1895, from Mr. Quinn.]

(G) 1896. H. Tryon—

Report of the Entomologist. "Annual Report of the Department of Agriculture, Queensland, for 1895-6," pp. 38 and 41. [This mentions the occurrence on apple and on peach, at Stanthorpe, of San José Scale (*Aspidiotus perniciosus*); also states, "More than one instance has come under my notice of trees from southern colonies (colony) being infested by the Pernicious Scale when inspected shortly subsequent to their receipt at the orchards where they have been planted."]

(H) 1897. C. Fuller—

"Notes on Coccidæ—Some Coccidæ of Western Australia," pp. 1-15, Perth, W.A., 1897. [Mentions the occurrence in Western Australia of *A. perniciosus*, Comst., and *A. perniciosus*, Comst., var. *eucalypti*, var. nov.]

(I) 1897. Walter Froggatt—

"San José Scale (*Aspidiotus perniciosus*, Comstock)." *Agricultural Gazette of New South Wales*, Vol. VIII, p. 874, December, 1897; and Department of Agriculture, N.S. Wales, Miscellaneous Publication, No. 197, Sydney, 1898. [In this particulars regarding its widespread occurrence in New South Wales are given, together with descriptive account, remedies, &c.]

(J) *1898. C. French—

"The San José Scale (*Aspidiotus perniciosus*, Comstock). "Guides to Growers," No. 35, Department of Agriculture, Victoria, January, 1898. This refers to its occurrence in the Wangaratta district of Victoria on trees derived from a Sydney nurseryman; also to a variety procured in the same district on eucalypt by Mr. Adcock, and named *eucalypti*.]

* The occurrence of *A. perniciosus* in Victoria would appear to date back to 1895; for in March of that year C. French sent some apple-twigs with many scales representing that insect to W. H. Maskell (*Agricultural Gazette*, New South Wales, VI., p. 868, 1895), which were probably also derived from Wangaratta (cf. *Australian Vigneron*, VI., 1895, p. 214).

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- (II.) Chapin (S. F., M.D.)—"Scale Insects," First Report State Board Hort. Commissioners. Sacramento, 1882.
- (III.) Chapin (S. F., M.D.)—"Progress of the Orchards of California during 1883." Ann. Rep. State Board of Hort. Commissioners for 1883. Sacramento, 1883.
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- (VIII.) Howard (L. O.)—"Further Notes on San José Scale." "Insect Life," vol. vii., pp. 283-295. Washington, 1895.

- (IX.) Howard (L. O.)—"On some Scale Insects." Trans. Massachusetts Hort. Soc., 1896, pp. 84-94. Boston, 1896.
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- (XII.) Smith (John B., Sc. D.)—"San José Scale (*Aspidiotus perniciosus*)." Report Ent. Dep. New Jersey Agri. Col. Exp. Stat. for 1897. Trenton, N.J., 1898.
- (XIII.) Cockerell (T. D. A.)—"The San José Scale and its Nearest Allies." Techn. Series 6, Divis. of Entom. U.S. Dep. of Agr., Washington, 1897.
- (XIV.) Webster (P. M.)—"The San José Scale in Ohio." Bull. 81, Ohio. Agr. Exp. Stat. Ohio, 1897.
- (XV.) Smith (John B., Sc. D.)—"The San José Scale and How it may be Controlled." Bull. 25, New Jersey Agr. Exp. Stat. Trenton, N.J., 1897.
- (XVI.) Hunter (S. J.)—"Scale Insects Injurious to Orchards." Bull., Dep. of Agr. University of Kansas. Topeka, 1898.

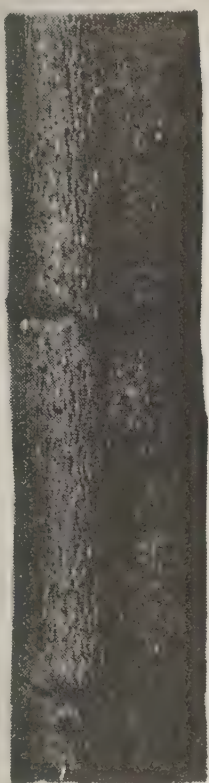
DESCRIPTION OF PLATES.

PLATE XL.—(From Photographs by F. C. Wills, Artist to Department of Agriculture.)

- FIG. 1. Apple-tree bark free from San José Scale. Natural size.
- „ 2. Apple-tree bark infested by San José Scale. Natural size.
- „ 3. Apple-tree bark infested by San José Scale. As seen when magnified three times linear.
- „ 4. Peach-tree bark infested by San José Scale. As seen when magnified three times linear.
- „ 5. Peach-tree bark—young shoot infested by San José Scale, showing male scales, &c. As seen when magnified six times linear.
- „ 6 and 7. San José Scale (?) on bark of Eucalyptus sp. (from specimens furnished by C. French). As seen when magnified one and three-fifth times linear.

PLATE XLI.—(With the exception of Figs. 1, 4, and 12—drawn by F. C. Wills—from publications of Division of Entomology, U.S. Department of Agriculture, and representing in each case the objects specified more or less highly magnified.)

- FIG. 1. Female Scale : *a*, central area or "exuviae."
- „ 2. Adult female, as seen from beneath, before development of eggs : *a*, proboscis or sucking tube, composed of 4 applied setæ or hairs.
- „ 3. Hinder extremity or anal segment of adult female, showing characteristic "fringe" : *a*, central lobes. (Note.—The "plates" or "squames" are not shown.)
- „ 4. Male Scale : *a*, central area or "exuviae."
- „ 5. Larva, or recently born insect : *a*, its hind foot ; *b*, its proboscis or sucking tube.
- „ 6. Larva recently attached.
- „ 7. Young insect already covered by secreted matter : *a*, as seen from above ; *b*, as seen from below.
- „ 8. The same somewhat older : *a* and *b*, as in Fig. 7.
- „ 9. Male immature insect after first moult, as seen from beneath.
- „ 10. Male immature insect after second moult, or pupa, as seen from beneath.
- „ 11. Adult male insect after having left male scale (Fig. 4) : *a*, its genital spike.
- „ 12. Eye of apple, with San José Scale occurring therein.



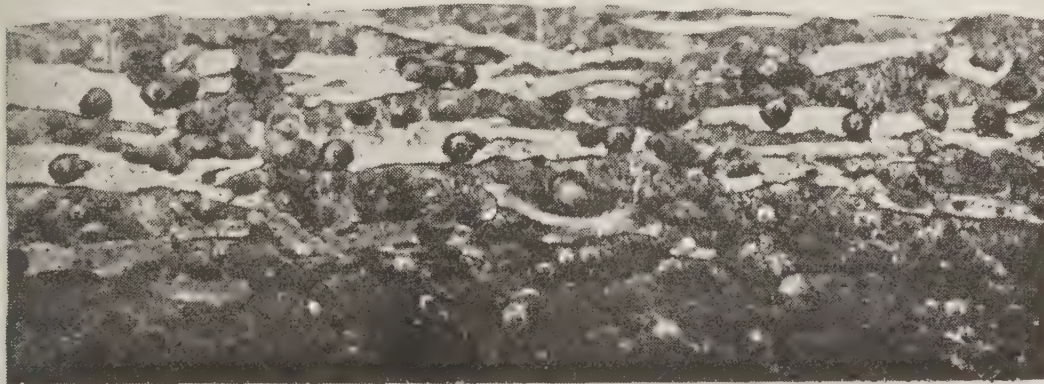
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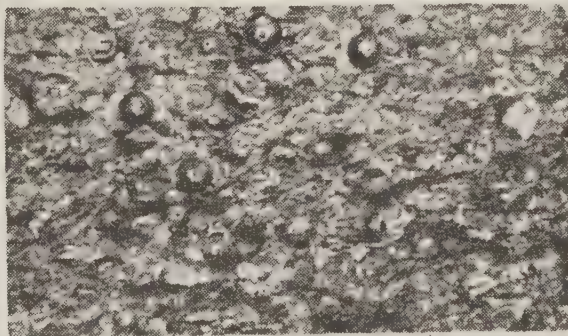
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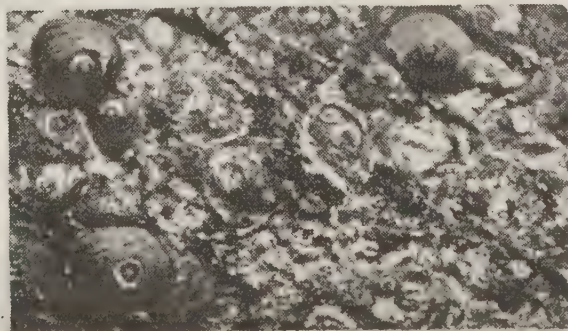
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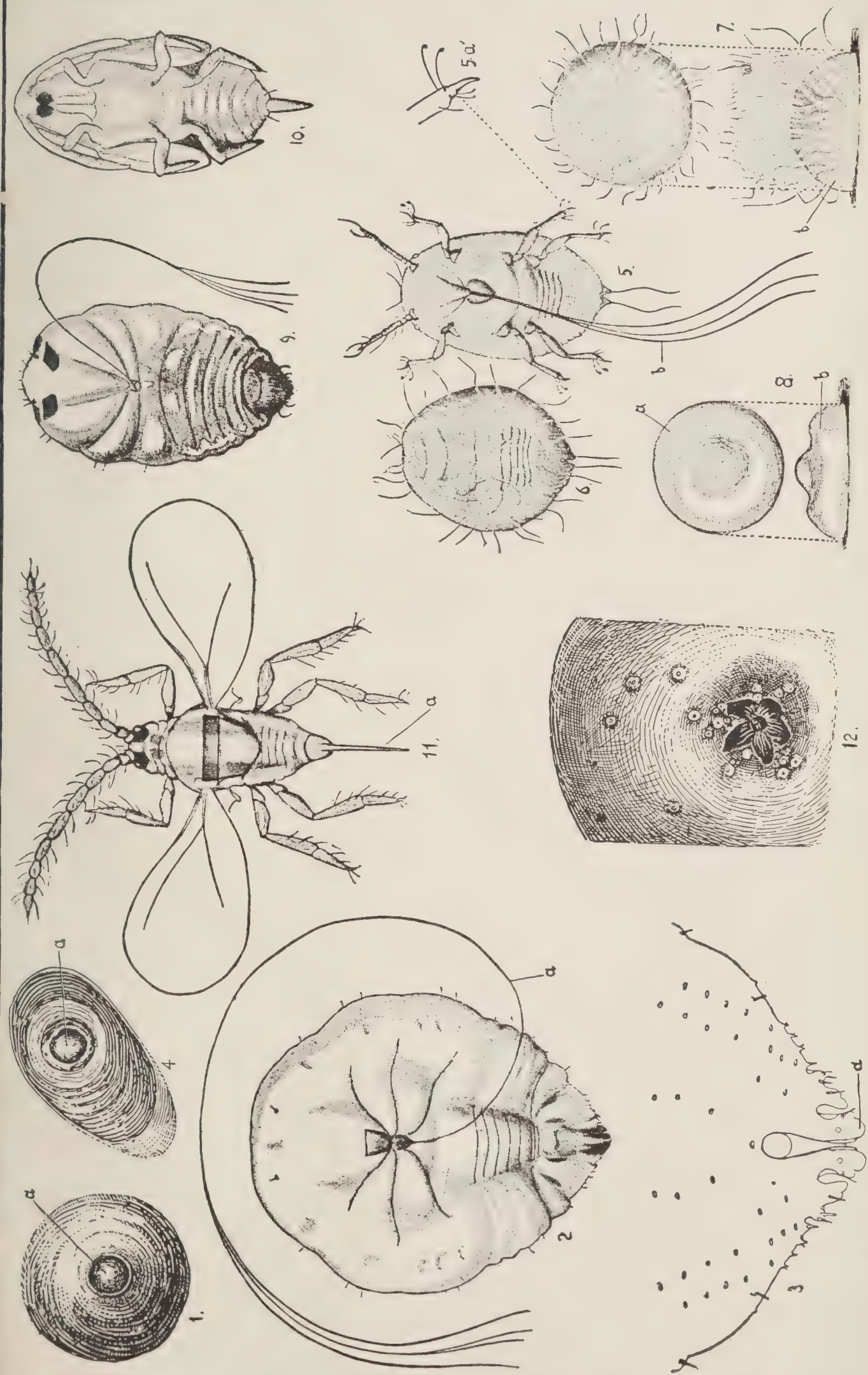


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F. S. Wills.



SAN JOSÉ SCALE INSECT (*Aspidiotus perniciosus*, Comst.)

Vegetable Pathology.

PREVENTIVE TREATMENT IN PLANT DISEASE.

HYBRIDISATION AND INOCULATION.

By HENRY TRYON,
Entomologist

IN an address delivered on 23rd April, 1898, before the Wellington Point Agricultural, Horticultural, and Industrial Association on "Preventive Treatment in Plant Disease," including in this category changes consequent on insect injury, the writer maintained that the hybridisation, cross-fertilisation, and inoculation of plants were procedures by the adoption of which plant maladies might be obviated.

By those not already conversant with the results already obtained in these provinces of special research, this proposition might be received with reasonable scepticism; and such an attitude would be commendable did this scepticism stimulate inquiry and not serve to bar the way to further investigation on the part of those by whom it had been assumed.

An instance of such state of mind with the possible occurrence of the latter contingency having already occurred with reference to the above proposition regarding hybridisation and inoculation, it may not therefore be amiss to briefly set forth some of the grounds for recommending resort to these procedures in the preventive treatment of plant diseases.

HYBRIDISATION AND CROSS-FERTILISATION.

It is universally admitted that plants that are in a vigorous condition are less prone to the incursion of disease than are such as are constitutionally weak, when both are being grown under identical circumstances. And it has been demonstrated by the late Charles Darwin, and accepted as a law by all naturalists, that cross-fertilisation is necessary for the production of vigorous offspring. As the outcome of years of research, Darwin proved that by cross-fertilisation plants were obtained which—as compared with others not cross-fertilised—exhibited not only increase in height, weight, and fertility of offspring, but also greater constitutional vigour. Moreover, this latter was manifested by the development of a special "innate power of the crossed plants to resist unfavourable conditions of growth," and in the fact that they died prematurely "independently of any innate cause that could be detected" far less frequently than did plants that were not crossed.* And he also found that "the good effects of cross-fertilisation were transmitted by plants to the next generation," and in some instances "to many succeeding generations."†

One of the ablest vegetable pathologists has thus expressed himself on the subject of breeding plants and the occurrence of plant disease:—"A number of the problems connected with the subject [Evolution of Parasitic Fungi] are suggested in the discussion of the various paragraphs [of the address], and the solution of these questions require not only the investigations of the mycologist but also of the practical fruitgrower. Propylactic treatment, no doubt, must be depended on in a great many cases; but in many others, by careful attention to the *breeding* of healthy, stocky, and resistant varieties of fruits and other plants, to this extent shall we be able to dispense with the knapsack sprayer. . . . One of the important problems is the development and fixing of disease-resisting varieties."‡

* C. Darwin: "Cross and Self Fertilisation of Plants," Chap. VII., 1876.

† *Op. cit.*, p. 438.

‡ G. F. Atkinson: "Some Tendencies and Problems in the Evolution of Species of Parasitic Fungi." Transactions, Massachusetts Horticultural Society, 1896.

With regard to the practical application of the processes of hybridisation and cross-fertilisation, in the prevention of special plant diseases, a few instances may be adduced:—

As is well known, although the wheat plant suffers greatly from the so-called rust-fungi, and the injuries attendant on their development in its tissues, there are certain varieties of it that, although they do not perhaps enjoy an absolute immunity from the attacks of this destructive organism under every condition pertaining to their growth, are still highly resistant thereto. It has accordingly been conceived by investigators that this highly desirable quality might be conferred upon the progeny of classes of wheats not already possessing it by the adoption of artificial cross-fertilisation in which one or other of the resistant varieties was made to take part. Moreover, the project has not only been entertained, but also acted upon. Especially has this been done by W. Farrer, of New South Wales (whose indefatigable labours in this direction are both widely known and appreciated), with the result that he has found not only that “the crossed seeds have always differed from the normal seeds of the mother variety by being larger,” but also that “if we cross varieties of different types we find the progeny differing quite as much in the quality of resistance to either or both of these rusts—i.e., *Puccinia dispersa* and *P. graminis*)—as in any other quality, and that from such varying progeny there may generally be selected either plants which possess more or plants which possess less of the quality of resistance to either rust than does either of its parents; further, that, by means of a system of cross-breeding of the above character combined with selection, varieties suitable for our climate which have been born with, and therefore possess—some of them in a higher degree than does either of their parents, as an attribute which is normal to them and stable in our climates—the quality of resisting the Spring Rust (*Puccinia dispersa*, Ericksson), can be and actually have been made; and that the varieties which resist the Summer Rust (*P. graminis*—‘the rust which does the damage’—Farrer) are more numerous, and the degree in which they resist it more complete, than is the case with the spring rust. I think from these data we may safely draw the conclusion that the making of varieties possessing suitability for our climate, in conjunction with sufficient ability to resist the summer rust, for our crops to be safe from serious (or, indeed, from any) injury by it is an easy matter, and only waits for its completion a few moist summers [that will render the performance of experiments on his part practicable—H.T.], even if the next rusty season does not show it has been actually accomplished already.”*—*Op. cit.*, pp. 165-6.

That which, as above related, has been accomplished by “crossing” in preventing disease, in the case of the wheat plant, has been exceeded even with the vine. And the case of this plant is all the more interesting since true hybridisation has been resorted to, or the union through the agency of their sexual products of distinct species, and the results obtained are the labours of many independent workers, including Millardet, de Grasset, Condere and Ganzin, Castel, Franc, and Terras amongst their number.

The question of preventing the attacks of phylloxera early engaged the attention of Millardet, and in the course of his investigations he foresaw a possible benefit that might accrue from raising hybrid progenies between vines such as *Vitis rupestris* and *Vitis riparia*, that were highly resistant to the attacks of the phylloxera, and the various varieties of the ordinary European *Vitis vinifera* that were so fatally infested by this notorious insect; and subsequently he raised such hybrids, and, moreover, found that they were endowed with the desirable characteristics sought.† And, again, others amongst those above mentioned experimented in the same direction, with like result.

* K. Farrer: “The Making and Improvement of Wheats for Australian Conditions,” a paper read before the Australian Association for the Advancement of Science, 10th Jan., 1898.—*Agr. Gazette of N.S.W.*, Vol. IX., 1898.

† Millardet: Notes sur les vignes Américaines. Ser. III. Essai sur l'hybridation de la vigne. Mém. de la Soc. des Sciences de Bordeaux, 1891. Ferner: Journ. d'agriculture pratique, 1892.

With regard to the efficacy of this means of preventing disease, in the case of the vine, the following is the testimony of the well-known viticultural authority, P. Gervais, in summarising the work of Millardet, Conderc, and de Grasset:—"In crosses between the American species and our European vine, a result has been produced that has exercised a most fortunate influence on the reconstruction of our vineyards. The resistance of the American parent, in certain cases relatively very rare, it is true, has passed entirely to the hybrid without losing any of its value by the mixture of the American blood with the blood of the non-resistant European vine, in such a manner that we have actually, for example, *Carbenet-rupestris* vines and *Aramon-riparia* vines, exactly as resistant as the better forms of 'rupestris' and 'riparia.'"—*Transl.**

Commenting upon the discovery of Millardet that has led to these results, the eminent German authority on Plant Pathology, Dr. K. F. von Tubeuf, has stated that it pointed to a method available in preventing many diseases amongst cultivated plants generally.†

The results obtained from hybridising American and European kinds of grape have been even further reaching than this. Certain vines, as is well known, are addicted to a disease named "chlorosis," that especially affects them when grown in soils rich in carbonate of lime; but there is one of American origin, originally derived from Texas, named *Vitis Belandieri*, that has not this drawback, being, according to the late Professor Viala, an ideal vine for calcareous soils. Experimenting with a hybrid raised by Millardet between this and the well-known European grape Chasselas, a grape very intolerant of calcareous soils, and therefore especially liable to this malady, P. Castel found that it could withstand without manifesting it a soil containing as much as 60 per cent. of the lime-salt named.‡

Moreover, a writer in the journal from which the above information has been derived, has stated that examples of an hybrid raised by Terras, in which L'Alicante (European grape) and *Vitis rupestris* (American grape) have taken part, have proved at the hands of Henri Paul almost proof against Mildew (*Peronospora*) during a terrible year for disease of this nature, when vines of other varieties adjacent to them were affected.

With regard to the application of this means for preventing disease in Queensland, it is well known to the writer that it was a subject that engaged the attention of the late Dr. Joseph Bancroft, who raised hybrid grape vines amongst other plants of analogous origin, in the number of which was a hybrid strawberry.

A hybrid strawberry also, the history of which is not known to the writer, has been raised by J. Pink, late director of our Brisbane Botanic Gardens, that, amongst other advantages, appears to be resistant to the attacks of the leaf disease caused by *Spherella fragariæ* that is so baneful—both in New South Wales and Queensland—to almost all other varieties of this esteemed fruit (A. H. Benson).

With regard to the apple it might be possible by cross-fertilisation between one or more of such varieties as the Irish Peach, Northern Spy, and Winter Majentin, that exhibit great resistance to the attacks of the Woolly Aphis or American Blight (*Schizoneura lanigera*), and apples that do not share with them this comparative immunity, to raise fruits that have all the good qualities that apples should present, but yet escape injury at the hands, or rather proboscis, of the insect named.

Again, it might be found possible to effect a cross between such American plums as the Wild Goose or Newman on the one hand, and examples of the European or Japanese type on the other, and so procure fruits that, whilst

* Prosper Gervais: "La reconstitution des terrain's calcaires III., Résistance au Phylloxera."—"Le Progress Agricole et Viticole," Tom. XXV., 1896.

† "Dieses Beispiel zeigt uns den Weg, wie wir mancher Krankheit dadurch vorbeugen können, dass wir widerstandfähige Arten suchen und zur Kultur weiter benutzen."—Pflanzenkrankheiten, p. 98, 1895.

‡ "Progress Agricole," Tom. XXV., p. 11, 1896.

presenting the excellencies that the latter already possess, have also the special resisting quality to the attacks of the fruit-maggot fly so conspicuous in the former.

Similarly, advantage might be taken of the different extents to which pears and apples are affected by *Fusicladium*, or "black spot" disease, to raise excellent fruits of these kinds free from the presence of this malady.

However, as in the case of the so-called "making" of rust-resistant wheats, hybridisation must be entered upon with the exercise of judgment and followed by discriminate selection; otherwise results other than those sought will be attained. As an instance of this may be cited the following:—"We have (states a writer) had under observation an interesting hybrid between De Soto Plum (*Prunus americana*) and an Oregon Plum (*Prunus domestica*?). In habit of tree and foliage the hybrids assume the characters of *Prunus americana*, our Wild Plum. This variety is [however, found to be] strongly prepotent in transmitting not only its special characteristics, but also a tendency to take a disease (*Cladosporium carpophilum*), which does not occur in our cultivated European Plum (*P. domestica*)."*

INOCULATION.

With regard to this procedure little beyond general considerations can be adduced in support of its employment as a means for preventing the occurrence of disease in plants.

Many maladies that they exhibit present this feature—viz., their active agents, whether germs or other bodies, are restricted in the first instance to the vessels or to the tissues with which these are immediately in connection. As instances of this may be mentioned the gumming disease of sugar-cane caused by a microbe, *Bacillus vasculorum*, Cobb, in the vessels thereof; and the new and most destructive disease of the potato, discovered by the writer and found to be occasioned by the presence of *Bacillus vasculorum-solani*, Tryon, similarly related to it; and the same obtains in other diseases with regard to the tissues.

Again, it is possible to introduce small dosages of chemicals or other reagents into the vessels and tissues of plants without prejudicially affecting the vigour and health of the latter. As an instance of this may be mentioned the *Hydrangea*, the flowers of which are pink or blue, in correspondence with the plentiful or comparatively pauc occurrence of available iron in the soil in which it is grown. Moreover, it has been found that when vines have been sprayed with Bordeaux mixture their leaves absorb into their tissues an appreciable amount of copper from the copper sulphate that this fungicide contains. Again, a permeability of plant vessels and tissues to bodies of various kinds, as well as the general translation of these when once introduced, is shown by well-known physiological experiments.

Chemicals or other reagents may therefore be brought into contact with the germs or other bodies originating disease, and either destroy them or counteract or inhibit their action. Thus an Italian investigator, Pichi, has alleged that experimental evidence is forthcoming to prove that the absorption by the foliage of the vine of copper sulphate is preventive of the occurrence of mildew occasioned by the growth of the parasitic fungus, *Peronospora viticola*, in the tissue.† A. N. Berlese, however, in commenting on this finding by P. Pichi, alleges that in using a solution of copper sulphate as weak as that mentioned by the latter there would be no deposit of copper sulphate in the tissue, and therefore no such action manifested as that implied. It may, however, be pointed out that this objection would appear to lack soundness, for, as has been subsequently demonstrated by Dr. Meade Bolton, pieces of metal that are absolutely pure, and not only such as are commercial and marked chemically pure, will, when

* "Cross Breeds and Heridity."—"Rural Life," 19th Oct., 1893, p. 12 (quoted in Bull. 23 Iowa Agr. Exp. Stat. 1893. *Op. cit.*, p. 915).

† P. Pichi: "Alcuni esperimenti fisiopatologici sulle vite in relazione al parassitismo della *Peronospora*." Bull. Soc. Bot. Ital.—1891, No. 2; 1892, No. 3. Abstracted at length by A. N. Berlese in "Rivista di Patologia Veget." I., pp. 325-7, 1892.

placed in pure cultivations of different micro-organisms, notwithstanding they are practically insoluble in the media of these cultivations, inhibit or prevent the growth of these organisms in a very marked manner; and in the absence of any suggested explanation of this phenomenon it may be presumed that a germicidal action by infinitesimal quantities is being displayed.*

The introduction of metallic salts into the tissue of plants, moreover, forms the special feature in a treatment employed in France, with—in some instances—marked success, in obviating the previously mentioned vine disease chlorosis, and known as “Badigeonnage Rassiguier.” This treatment consists in applying to all the fresh surfaces exposed by the pruning scissors or “secateur” a strong solution of sulphate of iron, at a time when there is free movement of the sap (*i.e.*, in October, in France). The absorption (states Rassiguier†) in this case takes place rapidly; and, after some days have elapsed on cutting a “courson” or a “bras de souche,” it is easy to detect traces of sulphate of iron by following up the tissue of the plant. In fact, according to L. Degrully, this solution can be observed to penetrate into the body of the branch from 10-12 centimetres below the point of insertion of the shoot through which the solution has entered. The benefit following the adoption of this process of inoculation has been fully dealt with by the last-mentioned authority,‡ and would appear to be very pronounced.

From the foregoing statements it would seem likely also that there may, after all, be some grounds for concluding that the observed freedom from disease, said in some instances to follow the act of driving metallic nails into the wood of fruit trees, may stand in the relation of cause and effect.

With regard to other forms of inoculation for preventing disease in plants it may be remarked that, though those maladies that might be attributable to the presence and action of bacteria have been little studied, “there are (to quote Dr. Erwin F. Smith) in all probability as many bacterial diseases of plants as of animals.” Moreover, with regard to the bacteria that produced maladies in plants, it may be further affirmed that they are closely related, both biologically and morphologically, to bacteria that produce maladies in animals. Again, in the course of their growth they both may produce acids, alkalies, enzymes, or other bodies. Thus, whereas in the case of animals immunity may be secured by inoculating into their systems products derived in the course of their development from pathogenetic bacteria, so also the same may happen when similar inoculation is performed on plants, and this seems especially probable since it has been demonstrated that the disease itself, with its casual agents, can be communicated to them by this procedure.

As to the employment of any method of inoculation related to that which consists in the use of serum, as in dealing with animal diseases occasioned by micro-organisms, it may be stated that, although Dr. Russell has concluded from experimental evidence that “vegetable cell juices, aside from their acid reaction, are entirely powerless against bacteria, and do not possess any germicidal properties like the blood serum of animals,”§ the experiments that he conducted were “too limited in number to afford any basis for a general conclusion”; and there are grounds for concluding that “it is not improbable that a great variety of bactericidal and protective substances occur in plants,” just as there are bodies contained in them, such as “the various essential oils and other vegetable products—*e.g.*, thymol, salicylic acid, benzoic acid, tannin, quinine, oil of cinnamon, oil of peppermint,” &c., that are known to “exert a powerful restraining influence on bacterial growth.”||

* Dr. Meade Bolton: “The Effects of various Metals on the Growth of certain Bacteria.” “International Medical Magazine,” December, 1894.

† “Progress Agricole,” 28th August, 1892.

‡ L. Degrully: “Traitement de la Chlorose.”—Montpellier, 1894.

§ Russell: “Bacteria in their Relation to Vegetable Tissue.” Thesis. Johns Hopkins University. 1892. 8vo.; p. 41.

|| Erwin F. Smith: “The Bacterial Diseases of Plants: A Critical Review,” &c., I *American Naturalist*, Vol. XXX., p. 632, 1896

Again, there are organisms that are met with in the tissues of plants in a condition referred by German writers under van Beneden's term "Mutualismus" that exert, as far as has been observed, no apparent influence upon either the vigour or development of their hosts, or if otherwise only after a comparatively long period has elapsed, although it has been suggested that the advantages of this "Mutualismus" may be only distinctly manifested when the plant is in need of a large amount of nitrogenous matter—for instance, during the ripening of the fruit.* These may yet prove to be destroyers of the true parasitic organisms occurring in plants, and therefore competent to prevent the maladies that these originate in them; and if so, seeing that plants previously free from their presence may be artificially infected by them, as shown by Janse and other investigators, they may be available for inoculation having for its end the prevention of disease.

* J. M. Janse: "Les Endophytes Radicans de quelques Plantes Javanaises," p. 201. Leyden, 1896.

Tick Fever.

INOCULATION FOR TICK FEVER.

MR. DYSON LACY, of Mount Spencer, in the Central district, has been hard at work inoculating his herd. Two thousand seven hundred beasts have undergone the operation, and no casualties have occurred in consequence of the treatment. This is a remarkable success. We are informed by Mr. C. J. Pound, Director of the Stock Institute, to whose efforts in the cause of prevention of tick fever the stockowners of the colony are so much indebted, that deaths after inoculation will be rare if the regular habits of the animals on their camps and pastures are not interfered with. Inoculation, he says, should be performed in the early morning or late in the afternoon.

Mr. Harvey, manager of Nebo Station, stated to Mr. Pound that he had inoculated 2,000 head of his own and of his neighbour's cattle. He sustained a loss of about 5 per cent. This was doubtless owing to the fact of many of the cattle having having been distributed after treatment.

We learn that the dairy farmers in the districts about the Pimpama, Coomera, Albert, and Logan are anxiously awaiting a visit and a public demonstration of the preventive treatment of cattle by Mr. Pound, when they will at once proceed to operate on their herds in view of the imminence of the tick invasion of the South.

Forestry.

SOME TIMBER TREES OF QUEENSLAND.

By J. W. FAWCETT,

Member of the English Arboricultural Society.

THE BROAD-LEAVED IRONBARK (*EUCALYPTUS SIDEROPHLOIA*, Benth.).

BOTANICAL DESCRIPTION.—The Broad-leaved Ironbark is a large tall tree, growing to a height of from 60 to 100 feet, with a circumference of from 1 to 4 feet. In favourable localities it reaches a height of 140 and 150 feet, with a girth of from 4 to 6 feet. It has a tall straight stem.

Bark.—It has a hard, persistent, rough, thick, black, deeply furrowed or grooved bark, but still flaky or separable into layers.

Leaves.—The leaves are alternate, or opposite, ovate-lanceolate, or lanceolate, in shape; muchly acuminate or with sharp points; straight or more frequently sickle-shaped; from 2 to 6 inches long; longer and broader on young trees than old ones; often rather thick, with numerous fine diverging veins.

Flowers.—The flowers, from six to twelve in number, are on angular flower-stalks, in bunches at or near the ends of the branches. They are whitish in colour, and appear in bloom from May to November.

Fruit.—The fruit is rather large, globular-truncate, or obovoid, in shape, and about a quarter of an inch in diameter. They seed from May to November.

VERNACULAR AND BOTANICAL NAME.—The Broad-leaved Ironbark (so called from its very broad leaves, especially those of young trees) is also known as the Large-leaved Ironbark (from the size of its leaves), Black Ironbark (from the colour of its bark), Red Ironbark (from the colour of its timber—but a misnomer), White Ironbark (another misnomer), Broad-leaved Rough Ironbark and Rough Ironbark (from the state of its bark), He Ironbark, and She Ironbark. The specific name, *Siderophloia*, means Ironbark, and was given to it by George Bentham, the eminent English botanist, but it is a name that this particular tree cannot lay exclusive claim to.

Distribution.—The Broad-leaved Ironbark is found in open forests on the ranges or on stony forest ridges, often in company with the narrow-leaved species (*E. crebra*, F. v. M.) in the coastal districts of New South Wales and Southern Queensland, and in many parts of the interior.

Uses.—The Broad-leaved Ironbark as regards timber is one of the most useful and valuable of our forest trees. It, however, seems to vary considerably in different localities. In some districts it yields one of the most durable and strongest of timbers, whilst in others it is considered inferior to that of *E. crebra*, F. v. M. It is dark in colour, varying from a brownish-grey to a red, hard, heavy, close-grained and strong. Sometimes it is inclined to split and shell. It has a high reputation for durability and strength, and is extensively employed for large beams in buildings, railway and other bridges, railway sleepers, and other purposes where great strength or durability is required. The timber is highly appreciated by wheelwrights, especially in the manufacture of spokes of wheels, and for poles for bullock-drays, &c. It is also adapted for tool handles. On account of its hardness, the timber is worked with some difficulty.

This tree yields much kino, and the inspissated juice (that is, the juice thickened by evaporation) of this tree is the well-known Botany Bay Kino. This gum contains 72·13 per cent. of kino-tannin, and is totally soluble in water. From this fact Allan Cunningham and other early botanists were accustomed to call the tree *E. resinifera*, a designation now applied to another species.

The variety *rostrata*, which has very large leaves measuring from 2 inches to 6 inches in width in young trees, has the operculum or flower-lid longer than that in *E. siderophloia*, Benth., and the valves of the capsule or seed pouch more prominent.

It is chiefly known under the name of the Large-leaved Ironbark.

It is found in the Port Jackson district of New South Wales, and on many of the ridgy, stony forest lands of the Moreton Bay and Darling Downs districts of South Queensland, especially about Taylor's Range.

It yields an excellent timber of a reddish colour, very hard, heavy, and close-grained. It is considered the best of all the ironbarks for building purposes, construction of railway and other bridges, in wagon-building, railway sleepers, piles, and other purposes where great strength is required. It is also much esteemed by coachbuilders and wheelwrights, as it furnishes a good valuable timber for poles and shafts of carriages and spokes of wheels. It is also largely used for fencing posts and rails.

The Narrow-leaved Ironbark is one of the most picturesque of the different species of *Eucalypti* called Ironbark.

General Notes.

HOW TO CURE SHEEPSKINS.

CARPETS and soft rugs are not a usual part of the generally uncomfortable furnishings of a house or hut in the Far West. At most the bare boards or ant-hill floors are adorned with a shrivelled calfskin dried in the sun. But with a little trouble sheepskins can be so manipulated as to form excellent warm rugs especially useful during the cold winter weather. *Work* tells how the skins may be cured in the following manner:—If dry, soak them in water till quite soft. Scrape off any fat which may be present. Now well wash them in warm soap and water; wring out, but do not rinse. Then leave them for about two days in the following mixture: To 5 gallons of soft water add $3\frac{1}{2}$ lb. of common salt, and stir well to dissolve. Then add $1\frac{1}{4}$ lb. of commercial sulphuric acid, and stir again. It should now taste keen like vinegar, but should not burn the tongue. This mixture may cause the hands to smart a little, but will do no harm. Then rinse in cold water, and wring out as dry as possible. Hang in the shade to dry. During the drying the skin should be rubbed between the knuckles as when washing clothes, pulled, stretched in every way, and scraped. Any hard parts may be reduced with pumice-stone, though scraping with a knife is quicker. As a finish, dust a little whitening over the skin, and rub this all over with pumice-stone. During the scraping and stretching the wool should be combed out, and not left till the skin has dried. Wallaby and other skins may be treated in the same way.

DESTROYING DODDER IN LUCERNE.

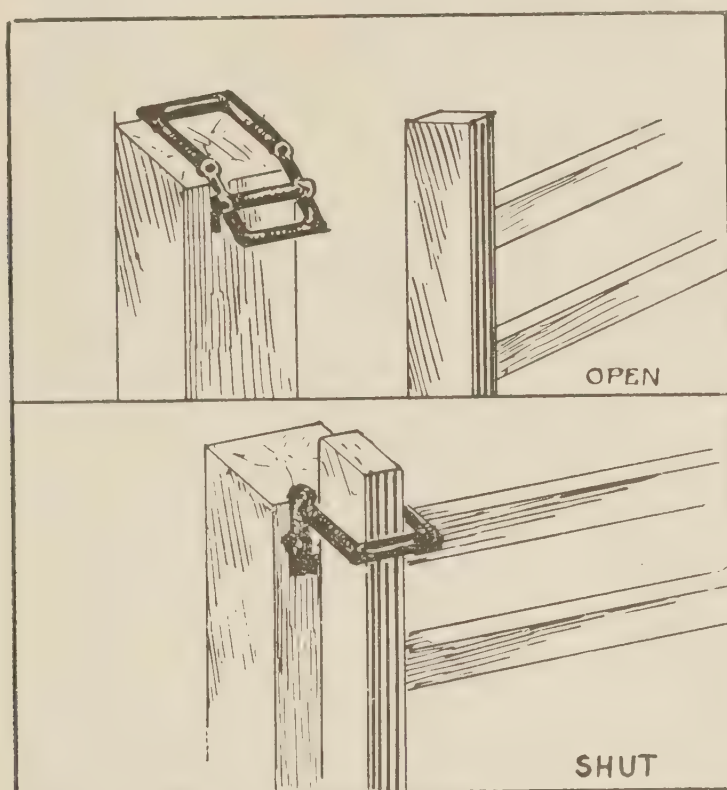
MR. AMOS RADCLIFFE, one of the most successful pioneer farmers of the early sixties at Oxley Creek, reminds us of a recipe which we published twenty-five years ago in the *Queenslander* for the destruction of dodder. The remedy was sulphate of iron in solution applied with a watering can. Mr. Radcliffe, whose lucerne fields we remember to have seen infested with dodder, applied the remedy with great success, and, as he says, it completely destroyed the dodder. The bare patches resulting from the application were soon filled up again with lucerne.

In connection with noxious weeds he mentions nutgrass, and suggests that, as so many amateur remedies have failed to destroy it, a reward might be offered for a certain effective remedy. He believes that this course on the part of the Agricultural Department would be productive of good results. But we would point out that, if anyone had discovered a sure cure for the pest, no Government reward would be needed, because most men who have discovered or who have thought they have discovered a panacea for vegetable or animal pests have not been chary of bringing their remedy into notice either through the journals or through the agricultural societies. The man who can destroy nutgrass utterly, and who withholds that knowledge of his from his fellow farmers until a reward is offered, is no true patriot. Most farmers we are acquainted with are only too glad to impart any valuable information they may have gained either from their own experiments or from those of others, without expectation of reward beyond what is theirs from a sense of having conferred a benefit upon the agricultural community.

AN INGENIOUS GATE LOOP.

WHO has not felt a desire to punish in some effective manner the man who, on entering a field or yard, leaves the gate open behind them. Such a visitor is often the cause of annoyance, trouble, and expense to the farmer or gardener.

But, seeing that from time immemorial this nuisance of left-open gates has existed, and will doubtless continue to exist, the next best thing is to construct a gate which shall be "immune" to such carelessness. There are, of course, circumstances under which it would be as wrong to close a gate as to leave it open, as, for instance, when a mob of cattle, horses, or drove of sheep is being brought out of a paddock and the gate has been purposely left open by the owner. A very good rule to observe on entering a neighbour's ground is to leave gates as you find them, as you cannot tell whether you will be doing right or wrong in closing them. Now here is a device given in the *Farmer and Stockbreeder* (London), which, if applied, will save the devout farmer from thinking hard things of his visitor who does not close his gate:—



The contrivance is simply a link in two parts, hinged together as shown in the illustration. When fixed to a gate-post the under part of the link (B) projects slightly. As the gate strikes the post the impact causes the upper part of the link (A) to fall over, thus securing the gate to the post. By simply lifting the link, the gate is unfastened. On gates swung to close themselves, the link arrangement works admirably, and the gate can easily be opened by a horseman without his dismounting, and he is furthermore saved the trouble of dragging a restive horse about in his endeavours to get him into a position which will allow of his closing the old-fashioned clip.

HOW TO CALCULATE THE WEIGHT OF LIVE STOCK.

1. Ascertain the girth, in inches, back of the shoulders, and the length, in inches, from the square of the buttock to a point even with the point of the shoulder-blade.

2. Multiply the girth by the length, and divide the product by 144, to arrive at the superficial feet; then multiply the superficial feet by the number of pounds per foot for cattle of different girths, the product of which will be the number of pounds of beef, veal, or pork in the four quarters of the animal.

3. For cattle of a girth of from 5 to 7 feet take 23 lb. to each superficial foot; and for a girth of from 7 to 9 feet, 31 lb. to the superficial foot.

4. For small cattle and calves of a girth of from 3 to 5 feet, 16 lb. to the foot; and for sheep, pigs, and all cattle measuring less than 3 feet, 11 lb. to the superficial foot.

5. When the animal is but half-fattened a *deduction* of 14 in every 280 lb., or 1 stone in every 20 stone, should be made; but if very fat 1 stone for every 20 should be *added*.

6. Suppose it is desired to ascertain the weight of an animal whose girth is 6 feet 4 inches and length 5 feet 3 inches.

7. Seventy-six inches girth by 63 inches length = 4,788; $4,788 \div 144 = 33.25$ superficial feet. Multiply this result by 23, and you will have 764.75 lb., or $54\frac{4}{7}$ stones.

8. The deduction or addition mentioned in paragraph 5 should then be made, according as to whether the animal may be in ordinary or in very fat condition.—*Journal of the Jamaica Agricultural Society.*

REMEDIES FOR THE STING OF BEES.

BEES are not apt to use their weapons against anyone unless enraged by some cause. There is only one period of the year when they are disposed to sting without provocation, and that is at the end of the clover honey harvest, and just before the massacre of the drones. If they are accustomed to a human presence, very little danger need be apprehended from walking gently about among the hives. But those who are timid and unacquainted with the nature and habits of bees should use a veil for protection when going amongst them and performing operations. The consciousness of being secure will give them confidence, and, as their information increases, their timidity will diminish.

No one, however, who engages in apiarian pursuits, though using every precaution, can calculate with certainty on enjoying absolute immunity. Bees will use their stings at times against both friends and foes, but the pain thereby occasioned is by no means so severe as has sometimes been represented. In many cases it lasts only a few seconds, and causes very little annoyance. The more frequently people are stung, the more insensible do they become to the poisonous influence. But with people of a highly nervous temperament it is different, and the effects of a single sting in their case are often serious. When the action of the heart is weak, the shock, though slight, sometimes proves too great for the system. Fortunately, such very delicate constitutions are rare, and it would be the height of imprudence for those so afflicted to put themselves in a situation of danger. Still, the very sensitive, by a strong act of will, might greatly mitigate consequences that are always aggravated by giving way to excited feelings. They should try, on being stung, to suppress any tendency to agitation, and to aid them in this, as well as to allay pain and relieve the tension of swelling, a half-glass of brandy, or even a whole glass if need be, may be administered. When parties are distracted and fevered, and almost thrown into fits through the influence of the poison of either wasps or bees, there is no better prescription; and in the case of a young woman dying from syncope, induced by the sting of bees, a doctor connected with the case remarked that in such cases, where syncope set in, the best remedy was a little brandy or ammonia. Amongst the various cures recommended for bee stings, and to be applied to the part, are olive oil, vitriol, laudanum, vinegar, honey, saleratus and water, salt and water, raw onion, tobacco juice, or the expressed juice of any green leaf. As animal poisons deoxidise the blood, their antidotes will be anything that contains much oxygen. The poison of the bee being an acid, an alkali must be employed to neutralise it. One great essential is, if heated, to get cooled as soon as possible, and to avoid becoming heated again for at least two days. Nothing tends so much to make the poison active as heat, and nothing favours its activity less than cold. Let the body be kept cool, and at rest, and the activity of the poison will be reduced to a minimum. Any active exertion whereby the circulation is quickened will increase both pain and swelling.—*Weekly Times.*

TOBACCO BONUS IN VICTORIA.

THE Victorian Government have decided to continue, during next season, the bonus of 3d. per lb. upon all Victorian-grown tobacco leaf of approved quality exported to markets abroad.

In this connection we learn from the *Australasian* that, notwithstanding that the crop last season was a failure owing to the blue-mould injuring the leaf, a number of farmers in the King River and Wangaratta district intend replanting this year, in the hope of taking advantage of the export bonus of 3d. per lb. offered by the Government on all leaf of approved quality shipped abroad.

TO MAKE UNFERMENTED WINE.

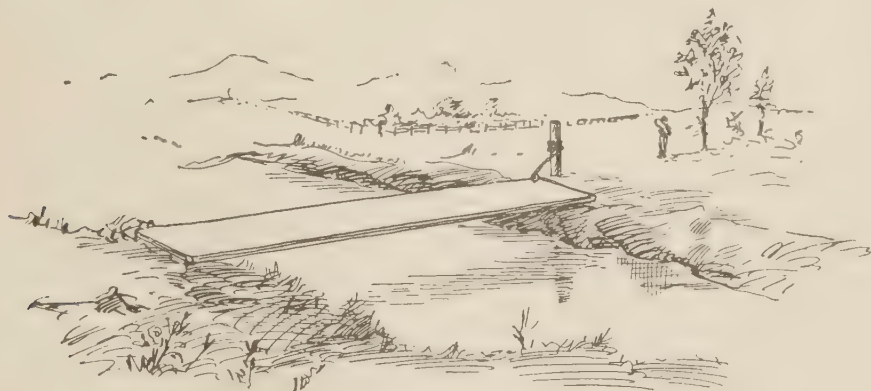
THE so-called unfermented wine is not wine at all. It is a pure fruit juice, and the juice of almost any kind of soft fruit can be preserved by the following process given in the *Journal of Agriculture* of South Australia:— Press out the juice of the fruit, separating it completely from the seeds and skins. Then submit it to a heat of 180 degrees Fahr. (never higher than 190 degrees Fahr., nor lower than 175 degrees Fahr.). Next filter it through a conical flannel bag, to extract the coagulated albumen and other flacculent matter. Finally place in bottles; put these into a boiler of cold water up to their necks; bring the water to a temperature of 200 degrees Fahr., close as can be—but never boiling—keep at that for fifteen minutes; then cork and seal *at once*, before cooling.

EXPORT OF WOOL.

THE total amount of wool exported from Queensland in the year 1897 is stated to have been as under:—20,907,298 lb. of clean, valued at £933,803, and 55,347,857 lb. of greasy, valued at £1,566,404.

A SIMPLE FOOTBRIDGE.

TRAVELLING through the Pimpama district last month, we were struck by the numerous narrow watercourses traversing the by-roads, over which there was no bridge nor even a log. The reason given for this was that every heavy rain caused a fresh in the gully which washed away the temporary crossings. In the *Australasian* we find a suggestion which our Pimpama friends might adopt



with great advantage to themselves. A plank 2 inches thick and a foot or more wide is attached at one end by a chain or rope, as shown in the illustration, to a stake driven firmly into the bank. The other end is left loose. When a freshet occurs the plank is only displaced by the water, but not carried away, and can be readily restored to position when the water subsides.

WHEN TO HARVEST ARROWROOT.

A GOOD test for ascertaining when arrowroot is ready for digging is given by Mr. D. Lahey, of Pimpama. Observe the outer leaf of the bulb. A triangular slit will be noticed pointing downwards. If the slit appears white the

bulb is still immature, but as soon as it turns purple the crop may be harvested. Arrowroot may be left to stand over for two seasons, as in the case of sugarcane.

RAISING TENDER SEEDLINGS.

Mr. W. SOUTTER, Acting Inspector of State Farms, gives the following handy and simple method of raising tender seedlings which are liable to suffer from winds and rain. Place the seed in a flower pot in free sandy soil, procure another empty pot two or three sizes larger; into this stand the pot with the seed; the rim of the seed pot should be about 2 inches below the level of the rim of the larger pot; this height can be regulated by an inverted pot of right size; over the whole place a sheet of glass slightly tilted to admit air. In this tiny extemporised glasshouse it is astonishing how few plants will damp off. This is owing to the absorbent nature of the walls. With a few of these wee glasshouses the average amateur can raise seedlings, no matter how tender they are.

NEW MALTING-HOUSE AT TOOWOOMBA.

A NEW malting-house is about to be erected at Toowoomba by Mr. A. H. Redwood. Its capacity will be from 60,000 to 80,000 bushels. Tenders for the work will be called for on the 1st June, and it is anticipated that the establishment will be ready to commence operations in December next.

A GOOD GARDEN LINE.

THERE are few implements (says Mr. Soutter) in connection with the garden that cause more annoyance than does the garden line; and there are few that require to be so often renewed. The line is liable to break whenever strained, or to be cut with the spade or hoe, and there is nothing more tantalising than when laying off a series of parallel rows your line snaps, and you find yourself in probably a sitting posture with innumerable yards of dirty line encircling your neck in consequence of a snap; or, when running out a seed furrow with the hoe, you suddenly come in contact with a knot, and away flies your line to either end of the ground. Now, the best line for general purposes is not a line at all, but merely a piece of No. 12 galvanised wire with a loop at either end, cut to lengths to fit the squares of your garden. Two 1-inch iron or steel rods, each about 2 feet long and tapered at one end, are used for stakes. Use one for an anchor, and the other as a lever for pulling taut. You can thus get a great strain on, which will enable you to not only draw a plumb line with a hoe, but to run a very accurate line with a Planet Junior drill. When not in use you can either leave your line on the ground between your rows, or it may be hitched up along your fences with no fear of rot or decay, no fear of breakage, nor the accompanying eccentricities of the hemp line, while the moral atmosphere of the garden will be most certainly considerably purified—try wire.

HOW TO BUILD A PONTOON.

MANY times it has occurred in this colony that travellers, teamsters, and others have been delayed for days owing to the depth and velocity of some otherwise insignificant creek. This delay has happened often near a station or township, when materials for the construction of a pontoon were procurable, but the genius of construction was not present. We well remember crossing the Upper Burdekin in a cask attached to a wire stretched across the river, and on one occasion the officer in charge of the Georgetown gold escort improvised a tub pontoon and safely carried over 10,000 oz. of gold. Mr. Wilson's (Water Supply Department) experience may be of value and interest to travellers in bridgeless districts. He says:—

During the month of February last the chief of my department telegraphed that he was sending 600 feet of casing to Wyandra, the present

terminus of the Charleville extension to Cunnamulla, and to have it removed to the site of the bore at once (forty miles distant). Heavy rains had fallen all over the district, and the Warrego was in a state of high flood. Leaving instructions for a horse-team to follow as quickly as possible, I proceeded to Wyandra to meet the casing, and crossed the river by a very small and shaky punt at Claverton mail change, eleven miles below the township of Wyandra. On making inquiries I learned that some opal-diggers had crossed a day or two previous on a raft and lost a lot of their rations in doing so. As the property entrusted to my charge was too valuable to allow of any risk, I decided to build a pontoon, and at once set about it. Mr. H. J. Carter supplied a coil of No. 8 wire and the use of a two-horse lorry; Mr. Moody, mine host of the Commercial Hotel, supplied (gratis) the use of eight Perkins' hogsheads; Mr. Murphy, the genial manager for Messrs. McGuigan and Co., supplied the use of the timber necessary (also gratis), provided it was not cut up too much. The work of construction I entrusted to Mr. A. Fraser, blacksmith and wheelwright. From former experience I knew that the sustaining power of a 52-gallon hogshead was something like 350 lb., and, not wishing to have the loads too heavy or the pontoon too large, I selected six out of the eight casks. After carefully driving on the hoops where necessary, and fitting the bungs in, these, with the timber selected from Mr. Murphy's stock, were conveyed to Mr. Fraser's place of business. Keeping in view the necessity of cutting as little of the timber as was practicable, the area of the deck of the pontoon was 7 feet by 13 feet by $1\frac{1}{2}$ inches, and constructed as follows:—For each side three casks were placed in line lengthways with an interval of 1 foot between them. This made a length of about 11 feet, allowing 3 feet to each cask and the interval between. On top of the casks (bung-hole up) two stringers 4 inches by 3 inches by 13 feet were placed and marked at the spots where two pieces of hoop iron to strap each cask to the stringers would reach, and the proper interval to hold the bilge of the casks also noted. This done, the stringers were placed on a level surface, and the holes bored for $\frac{3}{8}$ -inch bolts to hold the hoop iron when the casks were strapped on. The decking, after being placed in position, was retained in its place by a combing of 4 inches by 4 inches by 13 feet, which served the double purpose of preventing the casing rolling off, and saved nailing the decking, as a few bolts at intervals served to clamp the decking between the stringers and the combing. Three uprights on either side carried a handrail 2 feet 9 inches high. While the work of construction was going on I selected a spot about three-quarters of a mile from the township for launching the pontoon, and with suitable approaches on either side. First, a length of No. 8 wire was made fast to two trees, one on either bank in a somewhat oblique direction, so that the thrust of the current (seven miles an hour) should assist in taking the loaded pontoon over the distance (about 160 feet). About noon the following day everything was ready and conveyed to the spot. Attracted by the novelty, there were many bystanders, who gave most useful assistance. Two strong sliplinks were placed on the overhead wire to act as messengers, and made fast by two 10-foot lengths of wire to the up-current side of the pontoon. A length of wire was also placed fore-and-aft to act as a painter for pulling backwards and forwards. A buggy and five passengers were first of all taken over to try matters, and for the rest of the afternoon many took the opportunity of crossing over and swimming their horses alongside. A long-continued whistle in the distance announced the arrival of the train from Brisbane, and on repairing to the station I found the casing had arrived. At 8 p.m. the carrier from the bore reported himself, having found out the pontoon and crossed by it. Early next morning the casing was carried to the river bank, and with a horse on either bank to pull the pontoon backwards and forwards everything went off without a hitch. The bystanders were again numerous, and were the means of getting the casing loaded on the wagon, as well as pontooned across the Warrego. Mr. Jackson, police magistrate

of Thargomindah, accompanied by Miss Jackson, with a three-horse buggy, also crossed. After three days' use the materials used in the pontoon were returned to their various owners, and the chief of my department conveyed his special thanks to them for their generous assistance.

BRANDING WITHOUT HEAT.

THE *Hawera Star* gives the following description of a new mode of branding horses and cattle which has been invented by Mr. H. Gibson, of Taranaki. "The merit of the new method of marking hides lies in a secret preparation, into which the brand is dipped, and then applied to the hide of the beast, as in branding sheep. After the preparation has been on the skin a few hours, the hair comes off, and the patentee claims that it will never grow again." The *Australasian* notes that at the Egerton Farmers' Union horse fair some horses were branded to show how the brands were applied. No heating of the iron is required, and the composition, it is said, does not irritate the animal. Tanners and saddlers state that the marked portions are of equal quality to the rest of the hide. A great advantage claimed for the new process is that stock can be branded almost as fast as they can run through a race. Patent rights have been taken out for the new method of branding in all countries where stock-raising is extensively followed. A company has been formed to work the invention, having a capital of £35,000. If the new system of branding is all that is claimed, it will prove a great benefit to stockowners generally.

FRUIT FOR EXPORT.

It is stated that the accredited agent of a large London firm of fruit merchants is trying to make large purchases of oranges and lemons for the home market. He has visited the Parramatta district, which he intends to make his headquarters. He is negotiating with shipping companies now for cool chambers and storage on board the home boats. If the venture is a success, a large and important trade will probably be the result.

TO PREVENT FIRE IN CHIMNEYS.

A FLORIDA farmer gives the following preventive of damage by fire, owing to burning chimneys. More dwellings are consumed by bad flues than from any other cause. Accumulated soot makes a fierce and dangerous fire. The preventive is to burn occasionally in your stoves or chimneys sulphur—a $\frac{1}{4}$ -lb. to $\frac{1}{2}$ -lb. will do the business, cleaning your pipes and chimneys nicely and freeing them entirely from soot.

HEAVY BULLOCK-HIDE.

It is not often of late years that such heavy bullocks are sent to the market as used to be the case twenty or thirty years ago. The average weight of a draft of fats to-day is probably not more than 700. It must, therefore, have been an exceptionally fine bullock whose hide was sold in the middle of last month at Messrs. B. D. Morehead and Co.'s produce sale. His hide weighed 80 lb., and was sold at 10½d. per lb., equal to £3 7s. 6d. If the animal was purchased at the average price of fat cattle at Enoggera Saleyards at the same date—from £2 11s. 8d. to £3 17s. 6d., the top price for the month being £4 11s. 8d.—the profit on that beast must have been large. The price of the hide also is remarkable. Medium and light (38 lb. to 48 lb.) sold up to 4½d. per lb.; 68 lb. to 70 lb., up to 6d.; and best dry station hides, 5d.

A NEW BREED OF SHEEP.

WOOLGROWERS are awaiting with interest the final results of the experiments which the Agricultural Department of the University of California is prosecuting with the idea of evolving from a cross of the merino with the Persian a new and distinct type of sheep. The males of the merino and the females of the Persian are used. The object is to combine the advantages of a large fleece of fine quality with the ability to produce mutton of the best class from the same flock. The experiments so far are not sufficiently conclusive to permit the announcement of definite results, but the indications are that the experiments will prove completely successful. If a type of sheep which will produce wool comparing favourably in quantity and quality with that of the merino, and at the same time will equal the Southdown or some other mutton sheep in mutton production, is produced, the California station will have accomplished one of the greatest successes in recent years in the improvement of domestic animals. It is true that this combination of wool and mutton is claimed for several breeds of sheep already in general use; but it is also true that when many of these breeds come to a final test they are lacking in one respect or the other. It seems difficult to get a breed of sheep that combines the wool-producing and the mutton-producing qualities to the highest degree, and consequently the final results of the above experiments will be awaited with interest by sheep-breeders.—*Farmer and Stock Breeder.*

AGRICULTURAL AND HORTICULTURAL SHOWS.

THE Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

LIST OF AGRICULTURAL, HORTICULTURAL, AND PASTORAL SOCIETIES AND ASSOCIATIONS IN QUEENSLAND.

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Allora ...	Central Downs Agricultural and Horticultural Association	J. H. Buxton...	6 May
Beaudesert ...	Logan and Albert Pastoral and Agricultural Society	M. Hinchcliffe ...	
Beenleigh ...	Agricultural and Pastoral Society of Southern Queensland	Wilson Holliday ...	
Birthamba ...	South Kolan Agricultural and General Progress Association	G. W. Nixon ...	30 Sept.
Blackall ...	Barcoo Pastoral Society ...	F. Clewett ...	28 April
Boonah ...	Fassifern and Dugandan Agricultural and Pastoral Association	J. A. McBean ...	
Bowen ...	Bowen Farmers' Club ...	J. B. Thuman ...	
Bowen ...	Pastoral, Agricultural, and Mining Society ...	J. E. Smith ...	6 June
Bowen ...	Preston Farmers' Association ...	R. A. Foulger ...	
Bowen ...	Proserpine Farmers' and Settlers' Association		
Brisbane ...	Horticultural Society of Queensland ..	G. K. Seabrook ...	21 and 22 April
Brisbane ...	Moreton Agricultural, Horticultural, and Industrial Association	J. Duffield ...	
Brisbane ...	Queensland Acclimatisation Society ...	E. Grimley ...	
Brisbane ..	Queensland Fruit and Economic Plant Growers' Association	G. K. Seabrook ...	
Brisbane ...	National Agricultural and Industrial Association of Queensland	H. C. Wood ...	
Brisbane ...	Queensland Stockbreeders' and Graziers' Association	F. A. Blackman ..	
Brisbane ...	United Pastoralists' Association ...	Fredk. Ranson ..	
Bundaberg ...	Bundaberg Agricultural and Pastoral Society	A. McIntosh ...	
Bundaberg ...	Bundaberg Horticultural Association ...	H. E. Ashley...	
Bundaberg ...	Woongarra Canegrowers' and Farmers' Association	H. Cattermull ...	
Burpengary...	Burpengary Farmers' Association ...	D. J. Collins ...	
Caloolture ...	Caloolture Farmers' Association ...	G. Mallet ...	
Cairns ...	Barron Valley Farmers' Association ...	...	
Cairns ...	Cairns Agricultural, Pastoral, and Mining Association	A. J. Draper ...	25 and 26 May
Charleville ..	Central Warrego Pastoral and Agricultural Association	A. J. Carter ...	
Charters Towers	Towers Pastoral, Agricultural, and Mining Association	W. Tilley ...	
Clermont ...	Peak Downs Pastoral, Horticultural, and Agricultural Society	F. Leysley ...	
Cooktown ...	Cook District Pastoral and Agricultural Society	W. R. Humphreys ...	
Cunnamulla	South Warrego Pastoral Association ...	J. Winward ...	
Gayndah ...	Gayndah Agricultural and Horticultural Association	J. C. Kerr ...	
Gin Gin ...	Pastoral and Agricultural Society of Gin Gin	E. K. Wollen ...	
Gladstone ...	Gladstone Pastoral and Agricultural Association	W. J. Manning ...	
Gooburrum, Bundaberg	Gooburrum Farmers' and Canegrowers' Association	W. J. Tutin ...	
Goondiwindi	MacIntyre River Pastoral and Agricultural Society	A. Gough ...	
Gympie ...	Agricultural, Mining, and Pastoral Society	F. Vaughan ...	
Gympie ...	Gympie Horticultural Society ...	W. G. Ambrose ...	
Helidon ...	Helidon Scrub Farmers' Association ...	J. C. Collins ...	
Herbert River	Halifax Planters' Club ...	H. G. Faithful ...	
Herbert River	Macnade Farmers' Association...	E. C. Biggs ...	11 and 12 April
Herbert River	Ripple Creek Farmers' Association ...	J. W. Grimes ...	
Herberton ...	Mining, Pastoral, and Agricultural Association	John M. Hollway ..	
Hughenden ..	Hughenden Pastoral and Agricultural Association	W. H. Mulligan ...	10 and 11 May
Ingham ...	Herbert River Farmers' Association ...	...	
Ingham ...	Herbert River Pastoral and Agricultural Association	Bryan Lynn ...	
Ipswich ...	Ipswich and West Moreton Agricultural and Horticultural Society	P. W. Cameron ...	
Ipswich ...	Queensland Pastoral and Agricultural Society	Elias Harding ...	1 and 2 June

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Kandanga (near Gympie)	Kandanga Farmers' Association	N. Rasmussen ...	27 and 28 July
Kolan ...	Kolan Canegrowers' and Farmers' Association	C. Marks ...	
Laidley ...	Lockyer Agricultural and Industrial Society	John Fielding ...	
Loganholme..	Logan Farming and Industrial Association ...	F. W. Peek ...	12 April
Longreach ...	Marathon District Pastoral and Mining Society	Neil McPhie ..	
Lucinda Point	Victoria Farmers' Association	W. S. C. Warren ...	27, 28, and 29 July
Mackay ..	Agricultural, Pastoral, and Mining Association	F. Black ...	
Mackay ...	Pioneer River Farmers' Association	E. Swayne ...	
Maryborough	Maryborough Horticultural Society	H. A. Jones ...	
Maryborough	Wide Bay and Burnett Pastoral and Agricul- tural Society	G. Willey ...	
Milbong ...	Milbong Farmers' Association	T. R. Garrick ...	
Mitchell ...	Mitchell and Maranoa Pastoral, Agricultural, and Vinegrowers' Association	H. J. Corbett ...	
Mosman River	Mosman River Farmers' Association	..	
Mount Mee..	Mount Mee Farmers' Association	R. Thomas ...	
Nerang ...	South Queensland and Border Pastoral and Agricultural Society	W. J. Browne ...	
North Isis ...	North Isis Canegrowers' Association	W. J. Young ...	
Pialba ...	Pialba Farmers' Association	J. B. Stephens ...	
Pinbarren ...	Pinbarren Agricultural and Progress Asso- ciation	H. Armitage, senr. ...	
Rockhampton	Central Queensland Farmers' and Selectors' Association	T. Whitely, Coowonga	
Rockhampton	Central Queensland Pastoral Employers' Association	G. Mackay ...	
Rockhampton	Central Queensland Stockowners' Association	R. R. Dawbarn ...	10 and 11 May
Rockhampton	Rockhampton Agricultural Society	R. R. Dawbarn ...	
Roma ...	Western Queensland Pastoral and Agricul- tural Association	H. K. Alford ...	10 and 11 May
Roma ...	Yingerbay Farmers' Association	F. E. Glazier... ..	
Rosewood ...	Farmers' Club	P. H. Adams... ..	
Springure ...	Queensland Pastoral Society	G. R. Milliken ...	
Stanthorpe ...	Border Agricultural, Pastoral, and Mining Society	Geo. Simcocks ...	
Stanthorpe ...	Stanthorpe Horticultural and Viticultural Society	Jas. Scully ...	
St. George ...	Balonne Pastoral and Agricultural Association	T. M. Cummings ...	
Toowoomba	Darling Downs Horticultural Association ...	H. Hopkins ...	
Toowoomba	Drayton and Toowoomba Agricultural and Horticultural Society	H. Symes ...	
Toowoomba	Royal Agricultural Society of Queensland ...	F. Burt ...	2, 3, and 4 Aug.
Townsville ...	Townsville Pastoral, Agricultural, and Indus- trial Association (formerly North Queensland Pastoral and Agricultural Association)	J. N. Parkes ..	
Wallumbilla	Wallumbilla Farmers' Association	P. W. Howse ...	
Warwick ...	Eastern Downs Horticultural and Agricul- tural Association	J. Selke ...	
Wellington Point	Wellington Point Agricultural, Horticultural, and Industrial Association	J. B. Blaine ...	6 Aug.
Woombye ...	Woombye Fruitgrowers' Association	P. S. Hungerford ...	
Woowoonga	Degilbo Progress Association	F. A. Griffiths ...	
Woowoonga	Woowoonga Scrub Farmers' Association ...	H. B. Griffiths ...	

The Markets.

AVERAGE PRICES FOR APRIL.

Article.										APRIL.			
										Top Prices.			
										£	s.	d.	
Bacon	...	...	...	...	...	...	...	...	...	lb.	0	0	7½
Bran	...	...	...	...	...	...	...	...	...	ton	3	18	6
Butter, First	...	...	...	...	...	...	...	...	...	lb.	0	0	11
Butter, Second	...	...	...	...	...	...	...	...	...	„	0	0	7 ¹ / ₁₀
Chaff, Mixed	...	...	...	...	...	...	...	...	...	ton	3	11	0
Chaff, Oaten	...	...	...	...	...	...	...	...	...	„	4	10	0
Chaff, Lucerne	...	...	...	...	...	...	...	...	...	„	3	0	0
Chaff, Wheaten	...	...	...	...	...	...	...	...	...	„	2	17	0
Cheese	...	...	...	...	...	...	...	...	...	lb.	0	0	5 ³ / ₁₀
Flour	...	...	...	...	...	...	...	...	...	ton	13	6	0
Hay, Oaten	...	...	...	...	...	...	...	...	...	„	3	8	0
Hay, Lucerne	...	...	...	...	...	...	...	...	...	„	2	2	6
Honey	...	...	...	...	...	...	...	...	...	lb.	0	0	1 ⁴ / ₅
Japan Rice, Bond	...	...	...	...	...	...	...	...	...	ton	16	0	0
Maize	...	...	...	...	...	...	...	...	...	bush.	0	2	10
Oats	...	...	...	...	...	...	...	...	...	„	0	3	8 ² / ₅
Pollard	...	...	...	...	...	...	...	...	...	ton	4	7	6
Potatoes	...	...	...	...	...	...	...	...	...	„	7	13	0
Potatoes, Sweet	...	...	...	...	...	...	...	...	...	„	2	9	0
Pumpkins, Table	...	...	...	...	...	...	...	...	...	„	2	9	0
Sugar, White	...	...	...	...	...	...	...	...	...	„	15	10	0
Sugar, Yellow	...	...	...	...	...	...	...	...	...	„	13	10	0
Sugar, Ration	...	...	...	...	...	...	...	...	...	„	11	10	0
Wheat	...	...	...	...	...	...	...	...	...	bush.	0	3	11 ² / ₅
Onions	...	...	...	...	...	...	...	...	...	cwt.	0	8	2 ² / ₅
Hams	...	...	...	...	...	...	...	...	...	lb.	0	0	9
Eggs	...	...	...	...	...	...	...	...	...	doz.	0	1	1 ¹ / ₅
Fowls	...	...	...	...	...	...	...	...	...	pair	0	2	10 ¹ / ₅
Geese	...	...	...	...	...	...	...	...	...	„	0	4	7 ⁴ / ₅
Ducks, English	...	...	...	...	...	...	...	...	...	„	0	2	4 ⁴ / ₅
Ducks, Muscovy	...	...	...	...	...	...	...	...	...	„	0	3	5 ² / ₅
Turkeys, Hens	...	...	...	...	...	...	...	...	...	„	0	5	5 ² / ₅
Turkeys, Gobblers	...	...	...	...	...	...	...	...	...	„	0	9	1 ¹ / ₅

ENOGGERA SALES.

Article.								APRIL.		
								Top Prices.		
								£	s.	d.
Bullocks	...	...	...	...	...	...	...	4	11	0
Cows	...	...	...	...	...	...	...	2	13	6
Wethers, Merino	...	...	...	...	...	...	...	0	8	6
Ewes, Merino	...	...	...	...	...	...	...	0	6	1½
Wethers, C.B.	...	...	...	...	...	...	...	0	9	11
Ewes, C.B.	...	...	...	...	...	...	...	0	8	6
Lambs	...	...	...	...	...	...	...	0	9	8
Baconers	...	...	...	...	...	...	...	1	15	1½
Porkers	...	...	...	...	...	...	...	1	4	4½
Slips	...	...	...	...	...	...	...	0	8	9

THE BUTTER MARKET.

WE understand that the drought in the South has had a great effect upon the butter market, so much so that New Zealand is shipping some few hundred tons to the Australian markets, and butter which has been shipped to England is to be reshipped to Australia, as higher prices can be obtained here than in the old country.

CHEESE.

NEW ZEALAND cheese is quoted at 42s. to 43s. per cwt., and prices are hardening, owing, it is said, to the prospects of a lengthy war and to the restricted manufacture in England.

WHEAT.

WHEAT is firmer, and prices are likely to rule higher. Last month the price of wheat in the United States rose to 7s. 3d. per bushel.

Farm and Garden Notes for June.

FARM.—On the 24th of this month winter commences. Frosts, however, will have already occurred in many exposed parts of the South-western districts. Insect life is now comparatively dormant, and weeds are no longer a serious trouble and expense to the farmer. This modified weed growth gives him his opportunity to sow lucerne, rye grass, prairie and other grasses. But for lucerne especially this is the most favourable time of the year for sowing. It has happened on many occasions that when lucerne has been sown early, say at the end of April or May, a mild, dropping season has started a prolific growth of weeds which choked the young plant, and the only alternative, except reploughing the land, has been to put all available labour to picking out the weeds, a proceeding much too expensive to risk.

Sow also oats, barley, rye, vetches, clover, tobacco, carrots, mangolds, chicory, swedes, and buckwheat. Now is the time to get the land ready for maize, millets, sorghum, panicum, &c. Some recommend sowing maize in sheltered localities, but we should say decidedly that maize should not on any account be sown during this month. We once put in a crop of maize in April and had a good crop, but the winter was singularly mild, and frosts did not occur in the locality. Still, the time has not arrived for sowing maize, and all that should be done is to get the land in proper condition to receive it towards the end of July and in August. The same remarks are applicable to potatoes. Early potatoes should not be sown till next month, and then only in very sheltered situations. The frosts will now have blackened the arrowroot tops, and the bulbs fill out rapidly, and may soon be taken up.

Dig all sweet potatoes, yams, ginger, &c. Sweet potatoes may be stored as recommended in Vol. II., Part 2, p. 90, of this *Journal*. The place of storage should be cool, as very hot weather is injurious to them. Be careful that the tubers are perfectly ripe before they are stored. Wheat may be sown, and it is worth noting that early-sown wheat will often escape rust and other evils which affect later crops. This was well exemplified in the wheat crops of last season.

Kitchen Garden.—Hoe well among all growing crops. Transplant horse radish, eschallots, rhubarb, strawberries, seakale. Give new asparagus beds a second digging. Dig over the old rhubarb beds, and plant rhubarb, seakale, and asparagus, using plenty of well-rotted manure. During this month watercresses may be planted. Running or even standing water is not an absolute necessity for watercresses if care be taken. Excellent cresses have been grown on the dry, shaley hills of South Brisbane. They should be planted much like celery in trenches. Dig in plenty of good old manure into the bottom of the trenches, and sift a little fine soil over it. Dibble the cuttings in at a foot apart, filling up the holes lightly with rich mould, and give the whole a good watering, not a dash from a bucket, but a gentle, steady sprinkling from a fine-rose watering pot, which will fall "like the gentle rain from Heaven," as Shakespeare says, blessing alike the giver and receiver. In a month or six weeks the cresses can be cut. After cutting, give the beds a good dressing of manure all over, and water well. Repeat this treatment at every cutting. Watercress will also thrive well and yield good crops if sown amongst weeds on a creek bank, or on the edge of a waterhole or swamp.

It is almost needless to report that all the usual garden vegetables may be sown during this month, but we do not recommend sowing onions for a field crop; it is too late.

Flower Garden.—Proceed with planting. Take up and divide herbaceous plants. Prune roses and cut off all superfluous, straggling, and dead branches of trees and shrubs. Turfing lawns should be proceeded with at once. Sow candytuft, poppy, larkspur, dianthus, nasturtium, foxglove, Canterbury bells, &c. Plant bulbs as recommended in March. Dianthus will give a mass of bloom the whole year round if sown now. We have dianthus now in full bloom which was sown in March, 1897. By pruning and cutting off all dead blooms the plants are still in full vigour, and bloom profusely.

Cultural Notes for Tropical Queensland.

[The Cultural Notes for Tropical Queensland, kindly supplied by Mr. E. Cowley, Kamerunga State Nursery, are given a month in advance, for the obvious reason that the *Journal* cannot reach some parts of the far North until the month of issue is well-nigh over, and hence the monthly notes would be valueless until the following year.]

JULY.

PAINT farm outbuildings. Water cabbages, first dissolving a little kainit in the water. Early gathering of green peas and French beans may be made. As this is one of our dry months, and the weather is cool, stumping land should be proceeded with. Every vestige of weed life should be destroyed. Panna yams may be unearthed. *Musa Hilli* fibre may now be extracted. Falling scrub for further extension of agricultural areas should be performed. Cuttings of cinnamon and kola may be made and planted under bell glasses. The bulk of coffee crop should be off by the close of this month. All yams and turmeric can be unearthed. Commence collecting Divi-divi pods. New Guinea tobacco leaves may be gathered.

Orchard Notes for June.

By ALBERT H. BENSON.

THE marketing of citrus fruits is still one of the principal operations in many orchards throughout the colony, and the remarks anent this matter that have appeared in these notes for the past two months should be borne in mind and acted upon, as no matter what the quality of the fruit may be it always sells best when well packed and attractively got up, as the better it looks the better it sells.

In many parts of the colony deciduous fruit trees should be pruned during the month, and I strongly advise fruitgrowers to read my remarks on this subject which appeared in this *Journal* some months since, as thorough pruning is seldom carried out, many trees being allowed to grow of their own sweet will without let or hindrance. This neglect to properly prune fruit trees is conducive to the rapid spread of many insect and fungus diseases, as when trees are allowed to grow into a dense bush it is impossible to keep them clean by means of any of the ordinary methods adopted for the eradication of disease, such as spraying, &c.; and when they are allowed to straggle all over the place the straggling limbs are very apt to become more or less diseased.

Old neglected trees of good varieties, and of which the roots are still healthy, should be cut hard back, and all dead, broken, or badly diseased branches should be cut off, and a new head be allowed to form; but where such trees only produce inferior fruit, that is of no commercial value, they should be either destroyed, or, if wished, they may be grafted on next spring with good valuable varieties. Old neglected trees are the breeding-grounds of many diseases, and when they are of no value whatever they should be destroyed, as they are a menace and source of infection to the neighbourhood in which they are growing.

Do not be afraid to prune too heavily, as it is better to lose a crop and thereby get your tree or trees into a healthy state than to leave them in an unhealthy and unpruned condition, and get a poor crop of inferior fruit. Prune hard, and gather up and burn all prunings; do not let them lie about, but burn them up, as by doing so any diseases that may be on the wood that has been pruned off will be destroyed. Where trees are hard cut back, and only the main limbs are left, it is advisable to follow up this same pruning with a dressing that will destroy all insects or fungus pests still remaining on the tree, and for this purpose the best remedy is to paint the stems and branches with the following mixture, prepared thus:—Boil 2 lb. of sulphur and 1 lb. of quicklime in 2 gallons of water for about one hour, then add fine clay to the mixture till it is as thick as paint, and apply with a brush. Fine flour can be used in the place of the clay if desired, and will render the mixture more lasting.

Where San José, Greedy, Mussel, or Parlataria Scales are present, this method of treatment is the most efficacious, and is even better than spraying with the sulphur, lime, and salt wash mentioned in my pamphlet on spraying. This mixture is also of value for painting the stems and main branches of citrus trees covered with mosses or lichens, or attacked by white, red, circular black, mussel, or other scale insects.

Where the ground is ready plant deciduous trees this month; do not plant too deep, and cut back hard at planting. Clean up the orchard thoroughly, and plough and leave the ground rough as soon as pruned and the prunings are burnt. Gather up and destroy all fly-infested fruit of all kinds, as the more thoroughly the fly is kept down during the winter on the coast the fewer flies there will be to deal with in spring. Where not already done, see that pineapples are protected from frost, and keep the ground between the plants well worked in order to retain moisture, as the winter months are usually dry and the plants are liable to injury through drought. The same remarks apply to bananas, and the unripe bunches of fruit should be protected from slight frosts or cold spells by any suitable available material.

As these monthly notes have now been written for one complete year, I think I cannot do better than conclude my remarks by saying that I trust that they have been of some slight value to the fruitgrowers of Queensland, and that I will be only too glad to receive suggestions from fruitgrowers that will tend to make these notes more generally useful to them.

Public Announcements.

THE Editor will be glad to receive any papers of special merit which may be read at meetings of Agricultural and Pastoral Associations in Queensland, reserving, however, the right to decide whether their value and importance will justify their publication.

THE *Queensland Agricultural Journal* will be sent free of cost to all agricultural societies, schools of art, local libraries, and country newspapers in the colony, and to agricultural newspapers and institutions of importance in other portions of the world. Secretaries of agricultural, horticultural, pastoral, and kindred societies in Queensland are invited to furnish the Department of Agriculture with information as to their respective membership in order that the necessary number of copies of the Journal may be supplied.

PLANTS AND SEEDS FOR DISTRIBUTION.

LOGWOOD.

THE Curator of the Brisbane Botanic Garden states that there will be an unusually large quantity of Logwood seed for distribution in about a month, and also that a large number of young, healthy, and clean seedling trees will be available for distribution in May next to persons desirous of planting good and new varieties of this valuable dye-wood.

"THE DISEASES IN PLANTS ACT OF 1896."

Department of Agriculture,
Brisbane, 11th September, 1897.

HIS Excellency the Governor, with the advice of the Executive Council, and in pursuance of the provisions of "*The Diseases in Plants Act of 1896*," has been pleased to make the following Regulations.

J. F. G. FOXTON.

REGULATIONS.

Interpretation.

1. In these Regulations, unless the context otherwise indicates, the following terms shall have and include the meanings set against them respectively, that is to say:—

"Act"—"*The Diseases in Plants Act of 1896*";

"Minister"—The Secretary for Agriculture or other Minister for the time being charged with the administration of the Act;

"Inspector"—Any Inspector appointed under the Act;

"Place of Entry"—Brisbane, Cairns, and such other place as may be appointed by the Minister;—

and words importing the singular number shall include the plural, and words importing the plural shall include the singular, and words importing the masculine gender shall include females.

Importations prohibited.

2. The importation is hereby prohibited of all trees, plants, or portion thereof, including fruit or seeds (other than those manufactured) from Ceylon, India, East Indies, East African Colonies, and all other countries in which the coffee leaf disease (*Hemileia vastatrix*) is known to exist. Provided always that the Minister may, at his discretion, import from any of such countries coffee seed and trees, plants, vegetables, or portions thereof, all of which shall, when so imported, be suitably disinfected and detained, and grown in close quarantine for not less than twelve calendar months.

Special importations prohibited.

3. The importation is hereby prohibited of the following plants :—

- (a) Sugar-cane and banana plants grown in New Guinea, Sandwich Islands, Fiji, or other country in which the beetle borer of sugar-cane (*Sphenophorus obscurus*) exists ;
- (b) Potatoes from Europe and America, and all other countries in which the disease caused by *Phytophthorus infestans* exists ;
- (c) Plants or portions of plants of all and every species of Vitis from Europe, Asia Minor, America, Cape of Good Hope, New South Wales, Victoria, and New Zealand, and all other countries in which *Phylloxera vastatrix* is known to exist.

Provided always that the Minister may, at his discretion, import from any of the said places any of the plants mentioned in this Regulation, all of which plants shall, when so imported, be suitably disinfected, detained, and grown as directed in the next preceding clause.

Importations.

4. Trees, plants or portions thereof that are being introduced into the colony shall be received at a place of entry and not elsewhere.

5. All parcels of trees, plants, or any portion thereof, as well as all packages that contain any such articles introduced from beyond the limits of the colony shall on their arrival be distinctly marked with the name of the place or places where the said trees or plants have been grown, and in the case of such as are being introduced, or are being transmitted through the Post Office, the nature of their contents shall in addition be similarly set forth upon them.

6. All consignees, agents, or other persons interested shall within twenty-four hours notify the Minister or some person authorised by him of the arrival of any tree or plant, or any portion thereof, from beyond the colony at a place of entry, or through the Post Office, and shall not take possession of the same or any package that may contain or have contained the same until a certificate has been issued setting forth the fact that the said articles have been inspected and disinfected or otherwise dealt with as hereinafter provided in Regulation 8.

The officers in charge of Post Offices at the places of entry shall likewise, within twenty-four hours, notify the Minister or of the arrival from beyond the colony of any tree, plant, or portion thereof, or of parcels containing the same, and shall detain the same until otherwise authorised by him or

7. At the places of entry all trees, plants, or any portion thereof, and the packages that contain or have contained the same, shall on their arrival be detained at a place of quarantine for the purposes of inspection, disinfection, or being otherwise dealt with, as provided for in these Regulations.

8. All trees, plants, or any part thereof, and the packages that contain or have contained the same, imported or introduced into the colony shall be subject to detention and inspection by some person authorised by the Minister at any of the places of entry, and shall be subject to treatment by such person as follows, that is to say—

- (1) If such trees or plants be found on inspection to be subject to any disease not already known to exist in the colony, but liable if introduced and established to become prejudicial to its agricultural or horticultural interests, they shall be forthwith destroyed ;

But in all other cases, and whether diseased or otherwise, they shall on inspection be detained and immediately afterwards disinfected in accordance with any one or more of the methods for disinfection prescribed in Schedule No. 1 hereto.

- (2) If such trees or plants be found on inspection to be subject to any disease they shall, notwithstanding they have been disinfected, be further detained for a period of not less than fourteen days.

If at the expiration of the said period of fourteen days, and notwithstanding they have been subjected to process or processes of disinfection, they still harbour or are infested by insect or fungus pest or disease they shall be forthwith destroyed.

When such trees or plants have been treated as hereinbefore prescribed a certificate in one of the forms contained in Schedule 2 hereto shall forthwith be issued to the consignees, agents, or other person or persons interested.

9. Consignees or their agents shall give a delivery order to the inspector or other person authorised in that behalf for all such trees, plants, or parts thereof, as well as packages that may contain or have contained the same, in order that they may be conveyed to a place of quarantine. Consignees or their agents must pay the expense of such removal and unpack and prepare such trees, plants, and packages for inspection, disinfection, or other treatment, as provided for in Regulation No. 8. They shall also pay all costs, charges, and expenses payable in respect of the same. If the destruction of such trees, plants, packages, or portions thereof has not been ordered, on obtaining the certificate of inspection and disinfection provided for in Regulation 8 such consignees or agents shall repack and remove the same within twenty-four hours after the receipt of such certificate.

10. All trees, plants, or parts thereof, and packages that contain or have contained the same, conveyed to any place of quarantine for the purposes of inspection, disinfection, or other treatment provided for in Regulation 8, and not so dealt with by reason of the default of the consignee or his agent to provide the necessary payment for conveyance and labour for unpacking and repacking may be destroyed by the inspector or other officer authorised in that behalf, or may be held in bond at the cost of and on behalf of the consignee or his agent.

11. All imported trees, plants, or portions thereof may be seized and destroyed by or under the authority of the Minister, should no sufficient evidence of their being included in any certificate of disinfection be tendered by their lawful owner or owners on such evidence being demanded from them.

12. Culinary vegetables, cereals, and fruit are hereby excepted from the operation of the clauses 4 to 11, inclusive, of these Regulations.

Agencies for plant distribution.

13. Every nursery where plants are raised for sale, gift, or distribution shall be registered by the owners or occupiers thereof, at the Office of the Department of Agriculture, on or before the First of January in each year.

14. Every such registered nursery shall be inspected by an officer duly authorised by the Minister, at least twice a year, at an interval of not less than one month, and in the event of the officer reporting that such nursery is free from disease, a certificate in the form prescribed in Schedule 3 hereto shall be issued to the owner or occupier thereof. In the event of such nursery being subject to disease, the officer shall forthwith give to the owner or occupier thereof written notice in the form contained in Schedule 4 hereto, to take the necessary measures for the eradication of such disease.

15. The owner or occupier of every such registered nursery who raises for sale or distribution trees, plants, or vegetables, or portions thereof, not suitable for immediate culinary purposes, shall give to the party immediately concerned in any transaction, whether of gift, sale, or exchange for valuable consideration of any such trees, plants, or vegetables, a written guarantee in the form contained in Schedule 5 hereto, certifying his nursery is duly registered, and that the trees, plants, or vegetables have been disinfected by him, or his agents, by any one or more of the methods prescribed by Schedule 1 hereto, and that they are free from disease, and are in a vigorous and healthy condition.

16. All market gardens devoted exclusively to the cultivation of culinary vegetables, and all other gardens so far as relate to these kinds of plants, shall be excepted from the operation of the next preceding three clauses of these Regulations.

17. No person shall sell or dispose of, or offer for sale, any tree, plant, or vegetable, or portion thereof, infested with or infected by any disease.

Fruit fly.

18. All fallen fruit, of whatever kind (and whether harbouring insects or not), shall be gathered before noon of each day by the occupier or owner, or his or her agent, of any place where fruit-trees are being grown, and all pest-infected fruit shall be submitted to the process of boiling, or be buried beneath not less than one foot six inches of solid earth.

SCHEDULE 1.

DISINFECTION OF PLANTS AT PLACE OF ENTRY AND AT NURSERIES.

A. They shall be disinfected by being dipped for a period of not less than two minutes in a solution of 1 lb. of whale oil or any similar soap (80 per cent.) to every gallon of water. The said solution to be kept at a temperature of 115 to 120 degrees Fahrenheit.

B. Or in addition to being disinfected as prescribed in A, they shall be further disinfected by fumigation with hydrocyanic acid gas as follows:—They shall be placed in an air-tight box; for each and every 100 cubic feet of space contained therein shall be used for

Plants in pots or in leaf

400 grains of fused cyanide of potassium (98 per cent.) with $1\frac{1}{2}$ oz. of fluid sulphuric acid, 3 oz. of water:

Fruit trees and shrubs,

530 grains of fused cyanide of potassium (98 per cent.) with $1\frac{3}{4}$ oz. of fluid sulphuric acid, $3\frac{1}{2}$ oz. of water. The sulphuric acid and water shall be placed in an earthenware vessel in the box, the cyanide of potassium shall be added and the box immediately closed tightly, and shall remain so for not less than sixty minutes.

SCHEDULE 2.

Place of Entry :

Date :

This is to certify that the trees or plants imported into _____ by _____
have been inspected by me, and that they have been disinfected as set forth in Schedule 1.

Signed :

Date :

SCHEDULE 3.

This is to certify that the nursery situated at _____, and of which _____
is the registered owner or occupier thereof, has been inspected by me this day, and has been found
to be free from disease.

Signed :

Date :

SCHEDULE 4.

ORDER TO ERADICATE DISEASE.

I, _____, being a duly authorised person, hereby give you _____, of _____, notice that your orchard is diseased with _____, and I order you to take the following measure or measures within _____, for the eradication of such disease or diseases :—

- (a) All fallen fruit of whatever kind (and whether harbouring insects or not) shall be gathered before noon of each day and all pest-infested fruit shall be submitted to the process of boiling or be buried beneath not less than one foot six inches of solid earth ;
- (b) The trees shall be sprayed with one of the following mixtures (*the number of sprayings and intervals between sprayings to be stated*) :—

1.—*Resin wash for scale insects.*

Take 20 lb. of resin, 6 lb. of caustic soda (70 per cent.), 3 pints of fish oil, water to make 80 gallons. Place the resin, caustic soda, and fish oil in a large boiler with 20 gallons of water, and boil for three hours, then add hot water slowly and stir well till there are at least 40 gallons of hot solution; then add cold water to make up the total to 80 gallons. Never add cold water when cooking or the resin will be precipitated, and it will be difficult to get it in solution. The above is the strength to use for citrus trees; a winter wash for deciduous trees may be used one-half stronger, the total amount being made up to 54 gallons instead of 80 gallons.

2.—*Sulphur, lime, and salt wash.*

Take 40 lb. of unslacked lime, 20 lb. of sulphur, 15 lb. of salt, and 50 gallons of water. To mix take 10 lb. of lime, 20 lb. of sulphur, and 20 gallons of water; boil for not less than one hour and a-half, or until the sulphur is thoroughly dissolved, when the mixture will be of a light-amber colour. Slack 30 lb. of lime in a barrel with hot water, and when thoroughly slacked, but still boiling, add the 15 lb. of salt; when this is dissolved the whole should be added to the lime and sulphur in the boiler, and the whole boiled for half-an-hour longer, when water to make the whole up to 50 gallons should be added. Strain through a wire sieve, and keep well stirred whilst in use.

3.—*Bordeaux mixture.*

Winter strength—6 lb. bluestone, 4 lb. of unslacked lime, 22 gallons of water.

Summer strength—6 lb. bluestone, 4 lb. of unslacked lime, 40 gallons of water.

Prepare as follows (for the 40 gallons solution, the 22 gallons solution in proportion) :—

(1.) Dissolve 6 lb. of bluestone in 20 gallons of cold water in one cask, by placing it in a bag and suspending it in the water.

(2.) Slack 4 lb. of unslacked lime in another cask slowly by first pouring about 3 pints of water over it. This will reduce the lime to a thick cream, free from lumps. Water should now be added, stirring well till there is 20 gallons of milk of lime in the cask.

(3.) Stir the milk of lime up well, strain it, and pour the whole of the 20 gallons of milk of lime and the 20 gallons of bluestone water together slowly into a third cask, stir well for three minutes, and if properly made the mixture is fit for use.

4.—Any other mixture, particulars to be filled in by a duly authorised person.

5.—Fumigation with hydrocyanic acid gas, particulars to be filled in by a duly authorised person.

SCHEDULE 5.

This is to certify that [I or we] have duly registered [my or our] nursery situated at _____, and that [I or we] have disinfected the plants or trees sold this day to _____ of _____, by one or other of the methods prescribed by Schedule 1 of the Regulations under "*The Diseases in Plants Act of 1896*," and that the said trees or plants are free from disease and are in a healthy and vigorous condition.

Signed :

Date :

[CIRCULAR No. 2.]

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 Horticulture (Lectures)
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 Technical Drawing (Half-term)
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 Chemistry
 Physics
 Drawing
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THE QUEENSLAND AGRICULTURAL COLLEGE,
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 QUEENSLAND AGRICULTURAL JOURNAL.

THE present issue of the *Queensland Agricultural Journal* forms the first number of the second volume. The first volume only consists of six numbers in consequence of the *Journal* having been initiated in the middle of 1897. Future volumes will contain twelve numbers, dating from the 1st of January in each year.

[Extract from *New Zealand Gazette*, 9th December, 1897.]

Importation of Fruit infected with the Queensland Fruit-fly prohibited.—

Notice No. 504.

(L.S.)

RANFURLY, Governor.

A PROCLAMATION.

WHEREAS by the third section of "The Orchard and Garden Pests Act, 1896," it is enacted that the importation of any plant (as defined by the said Act), fungus, parasite, insect, or any other thing likely to cause the spread of any infection in the orchards of the colony, may be prohibited by Proclamation:

And whereas it is expedient that the fruit and insects hereafter mentioned should be prohibited:

Now, therefore, I, Uchter John Mark, Earl of Ranfurly, the Governor of the Colony of New Zealand, in exercise and pursuance of the said power and authority conferred upon me by the said Act, do proclaim that the importation into New Zealand of the fruits, parasites, and insects hereinafter mentioned shall be and is hereby absolutely prohibited, that is to say—

Any fruit infected with the Queensland fruit-fly (*Tephrites*), or in or on which any such pest is or has been present in any form or stage of development.

And if any fruit hereby prohibited is imported into the colony, it shall be dealt with, together with any package containing the same, in the manner provided by section 6 of the said Act with respect to plants and other things unlawfully introduced to the colony.

Given under the hand of His Excellency the Right Honourable Uchter John Mark, Earl of Ranfurly, Knight Commander of the Most Distinguished Order of Saint Michael and Saint George, Governor and Commander-in-Chief in and over Her Majesty's Colony of New Zealand and its Dependencies; and issued under the Seal of the said Colony, at the Government House, at Wellington, this seventh day of December, in the year of our Lord one thousand eight hundred and ninety-seven.

JOHN McKENZIE,
Minister for Agriculture.

GOD SAVE THE QUEEN!

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VOL. II. JANUARY, 1898. PART I.



AUDAX

FIDELIS

AT



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FEBRUARY, 1898.

PART II.



AUDAX

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AGRICULTURAL JOURNAL



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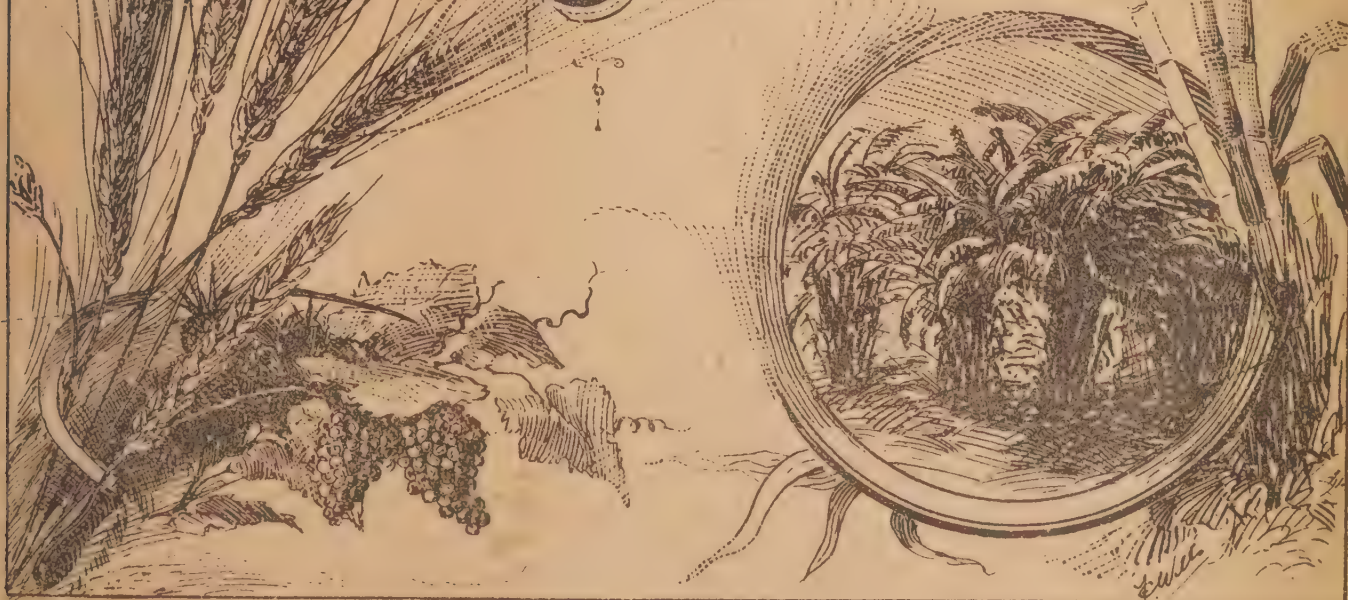
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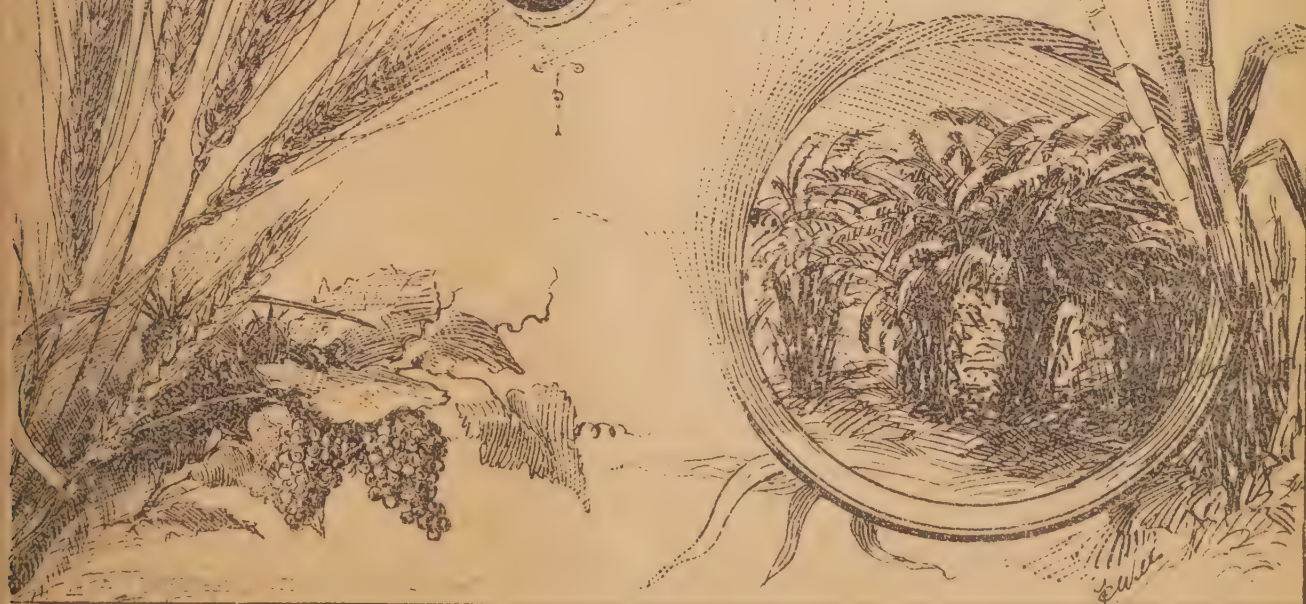
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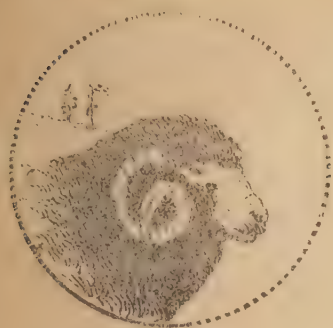


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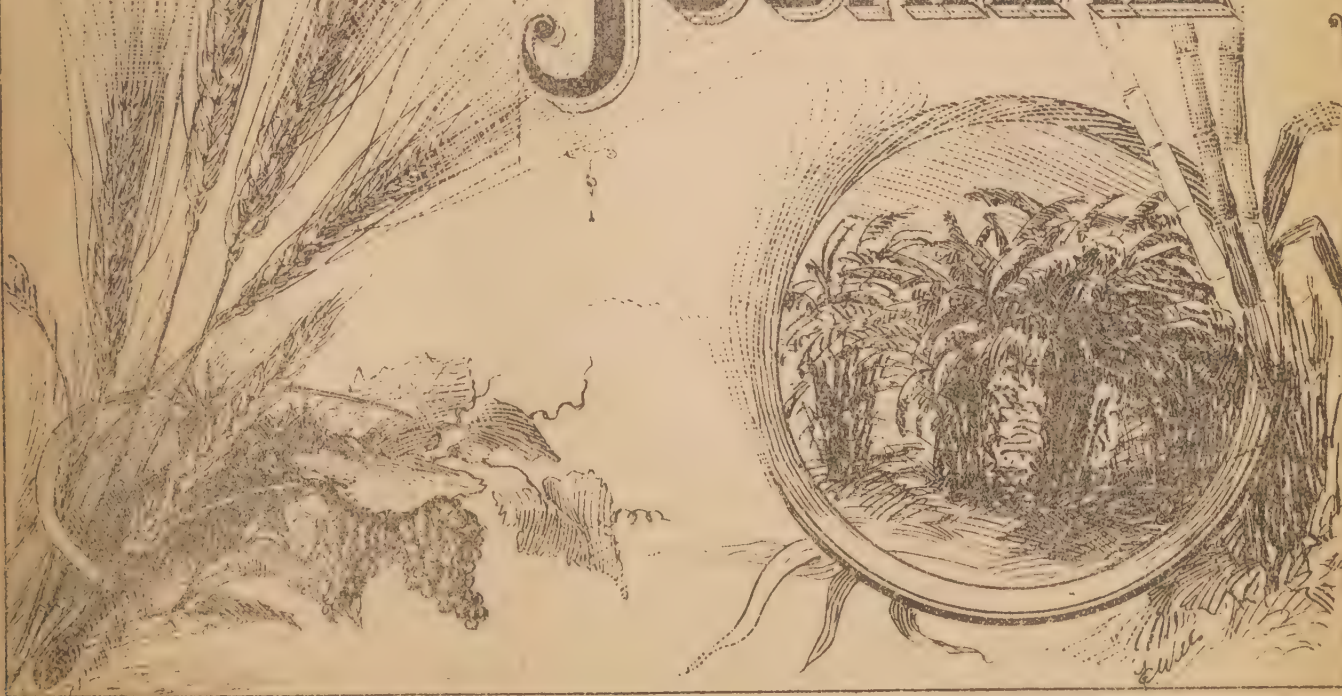
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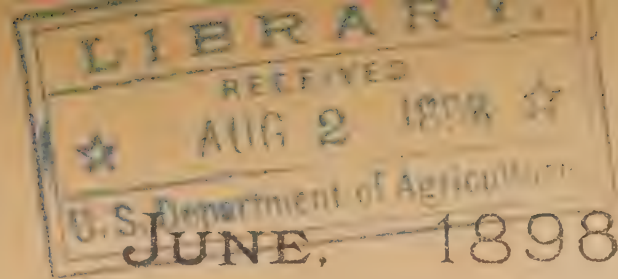
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